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Strait of Georgia Sport Fishery Creel Survey Statistics for Salmon and Groundfish, 1989

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STRAIT OF GEORGIA SPORT FISHERY CREEL SURVEY

STATISTICS FOR SALMON AND GROUNDFISH, 1989

by

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ABSTRACT

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Catch and effort statistics for the Strait of Georgia tidal sport fishery are presented for each month in 1989. The statistics were derived by combining the data from over 31,000 interviews and 68 aerial surveys. Estimates were provided for the number of sport fishing boat trips and the catches of chinook, coho, pink, sockeye and chum salmon along with rockfish, lingcod, dogfish and other finfish. Also given are numbers of marked (adipose fin-clipped) and unmarked chinook and coho examined during the creel survey, the age composition of chinook and the length frequency distribution of chinook, coho and lingcod catches. The appendix includes all catch and effort statistics for each combination of month and Statistical Area.

Key words: salmon, groundfish, creel survey, sport fishing, catch, effort, age composition, length distribution.

RÉSUMÉ

Collicutt, L. D. et T. F. Shardlow. 1990. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1989. Can. MS Rep. Fish. Aquat. Sci. 2087:75p.

Les statistiques sur les prises et l'effort de pêche dans le cas de la pêche sportive dans les eaux à marée du détroit de Géorgie sont présentées pour chaque mois de 1989. Les statistiques ont été établies en réunissant les données de plus de 31 000 entrevues et de 68 levés aériens. Des estimations ont été fournies pour le nombre de sorties des bateaux de pêche sportive ainsi que le nombre de prises de saumon quinnat, de saumon coho, de saumon rouge et de saumon kéta avec des sébastes, des morues-lingues, des aiguillats et autres poissons. On indique également le nombre de saumons quinnat et coho marqués (nageoire adipeuse coupée) et non marqués examinés dans le cadre de l'enquête sur la pêche sportive, ainsi que la composition par âge et la répartition par longueur des prises de saumon quinnat. L'annexe comprend toutes les statistiques sur les prises et l'effort de pêche pour chaque combinaison de mois et de zone statistique.

Mots-clés : saumon, poisson de fond, enquête de pêche sportive, prises, effort, composition par âge, distribution de longueur.

1.0 INTRODUCTION

This report documents the 1989 catch and effort statistics for the Strait of Georgia sport fishery and presents methodology for collecting these data. During the 1970s, the sport fishery grew to be the largest harvester of chinook and coho salmon in the Strait of Georgia. Figure 1 and Table 1 show historical catch statistics for the Strait of Georgia sport fishery for the period 1960-1989. In the late 1970s, fisheries managers recognized the need for accurate catch statistics. In 1980, the Strait of Georgia Creel Survey Program was initiated to meet the need for accurate and timely sport catch statistics primarily for chinook and coho. Since then, the objectives of the Creel Survey Program have been expanded to provide accurate catch estimates for all major sport-caught finfish, age composition of chinook catches and length distribution of chinook, coho and lingcod catches. This report is one of a series of Strait of Georgia Creel Survey Reports which document annual creel survey activities and estimation procedures, and provide official published Strait of Georgia tidal sport fishery catch statistics.

In 1989, the creel survey gathered a complete set of annual sport fishing data for the Strait of Georgia. There were no project interruptions, and interview and overflight data were collected on a continuous basis throughout the year.

In this report, all figures, tables and appendices are located at the end of text.

2.0 METHODS

The Strait of Georgia Creel Survey is comprised of two independent surveys: angler interviews and aerial overflights. Angler interviews provide data on sport fishing catch per unit effort (CPE) and daily activity patterns. Aerial overflights provide estimates of the total sport fishing effort in the study area at the time of the aerial survey. These data are combined to provide monthly estimates of total sport fishing effort and total catch of salmon and groundfish in the sport fishery. In its simplest form, the estimated total catch is calculated by multiplying the estimated total effort by catch per unit effort.

The design of the Strait of Georgia Creel Survey conducted in 1989 was similar to that used by DPA Consulting Ltd. (1982) with some modifications to the data analyzed, sampling intensity, flight routes and data processing. Sampling was conducted during each month of the year and estimates were produced for 10 time periods. The January and February data were grouped together, as were the November and December data because of reduced fishing activity and sampling in these winter months. Mid-week days and weekend days were considered independently because sport fishing activity is known to differ markedly for the two types of days. The Strait of Georgia study area (defined in

Appendix C) was stratified by geographic region. Catch and effort statistics were produced for each of the 10 Statistical Areas within the Strait of Georgia (Areas 13 - 19A, 19B+, 28 and 29, where Statistical Area 19B+ includes the portion of Area 20 east of Sheringham Point) (Fig. 2). Appendix C provides a complete description of the study area. Data collection, entry and preliminary processing were conducted by LGL Ltd. environmental research associates. Estimation of the catch and effort statistics was conducted by the Department of Fisheries and Oceans.

2.1 FIELD SURVEYS

2.11 Angler Interviews

Sport fishermen were interviewed at the end of their fishing trip to determine the time spent fishing, the locations fished and the catch of each species on the trip. Demographic information was also collected during each interview. Figure 3 shows the interview form used in 1989.

Interviewers trained in fish identification inspected each boating party's catch. Unlike other methods of collecting sport fishery information, such as mail-in or telephone surveys, this approach to determining sport fishery catch resulted in no memory-related recall bias, non-response bias, or fish identification concern. Landed chinook and coho were checked for a missing adipose fin which indicates the presence of a coded wire tag embedded in the fish nose cartilage. In addition, scale samples for age determination and measurements of nose-fork length were taken during every sampling shift. Five scales were removed from the INPFC (International North Pacific Fisheries Commission) preferred area of each biosampled chinook (Mosher 1968).

In 1989, the interviews were conducted each month at a maximum of 46 of the 50 designated landing sites (boat ramps, marinas, or resorts, Appendix C) representative of the sport fishing activity in each Statistical Area. The number of sites selected in each area was dictated by targets of desired precision and number of surveyors available. For each area - day type - work block stratum, sampling shifts at a site were chosen on a near random basis from the total number of shifts available. For definition of the above terms (day type, work block, shift) see Appendix A.

2.12 Aerial Overflights

Aerial surveys, conducted from float planes travelling along pre-defined routes, allowed observers to count vessels actively sport fishing throughout the Strait of Georgia. Planes flew at an altitude of 500-700 feet to facilitate a broad range of vision and still allow easy identification of vessel characteristics. Each plane carried three observers, two on the

right side and one on the left, and each observer counted sport fishing boats to his/her side of the flight path. Figure 2 shows the flight paths used in 1989. The winter (October - April) flight path was slightly reduced to correspond with the lower winter effort.

The flight path and time of departure were designed to cover major concentrations of sport fishing activity at peak periods. Whenever possible, the route was flown to keep most of the sport fishing boats to the right side to allow averaging of the two right side counts. To maximize precision, flying times during which fishing effort was rapidly changing were avoided. The number of overflights each month was governed by targets of desired precision and by the expected number of interviews from a given number of sampling shifts (English et al. 1986). The days for overflights during a month were randomly selected for each day type.

2.2 DATA ANALYSIS

Data analysis included calculation of catch and effort statistics, calculation of variance of total fishing effort and total catch, estimation of marked chinook and coho salmon, estimation of age and length composition of chinook catch and length frequency distribution of coho and lingcod catch. Appendix A details the methods and equations used in the above data analysis.

3.0 RESULTS

3.1 DISTRIBUTION OF SAMPLING EFFORT

Table 2 shows the number of creel survey interviews conducted with anglers who had been actively fishing by month and Statistical Area in 1989, and the number of monthly overflights. A total of 31,382 interviews, of which 24,763 involved actively fishing anglers, and 68 overflights were conducted in 1989. Figure 4 shows that the monthly distribution of interviews generally reflected the monthly distribution of fishing effort (number of boat trips, Table 3). Interview effort was reduced during winter months, especially for Statistical Areas 13, 14 and 15 in the northern portion of Strait of Georgia (Table 2). The total interviews represent 5.2% of the estimated total fishing effort for the entire study area (603,331 boat trips, Table 3). The interviews involving actively fishing anglers represent 4.1% of the total fishing effort and ranged in each Statistical Area from a low of 1.4% of the estimated fishing effort in Area 18 to a high of 7.6% in Area 28 (Tables 2 and 4).

3.2 SPORT FISHING EFFORT AND CATCH

The 1989 Strait of Georgia sport fishing effort and catch statistics are summarized

for each species by month in Table 3 and by Statistical Area in Table 4. Appendix B shows the fishing effort and catch statistics by species for each combination of month and Statistical Area.

Sport fishermen made 603,331 boat trips during 1989 which is comparable to the fishing effort in recent years (Fig. 1, Table 1). The fishing effort in 1989 followed the same general seasonal pattern as seen in previous years (Table 3, Fig. 5). Effort levels climbed steadily from April, peaked in July and August, and declined rapidly in September and October.

The total finfish sport catch in the Strait of Georgia in 1989 was estimated at 1,088,680 pieces (including steelhead and cutthroat trout, Table 3) and consisted of 71% salmon and 29% groundfish. An additional 1,201,306 salmon of mixed species were released by anglers (Appendix B-8). Salmon and groundfish catches are discussed below.

3.21 Salmon

Salmon sport catches in the Strait of Georgia in 1989 totalled 774,290 pieces (Tables 3 and 4) and consisted of 64% coho, 17% chinook, 16% pink salmon, 2% sockeye and 1% chum salmon.

For the first time since 1984, chinook sport catches showed a slight increase over the previous year. Anglers took 132,846 chinook in 1989 (Tables 3 and 4), compared to 119,117 in 1988 and 121,081 in 1987 (Fig. 1, Table 1). Monthly chinook catches showed an extended catch peak from May through August (Fig. 6, Table 3). Seasonal catch efficiency for chinook in 1989 showed reduced levels similar to those in 1987 and 1988, averaging 0.2 fish per boat trip and peaking in the winter months at 0.7 fish per boat trip (Fig. 7, Table 5).

The continued low chinook catch and the reduced catch efficiency were probably a result of a continued low abundance of this species and, to a lesser extent, the new sport fishery regulations (see below).

A number of new sport fishery regulations were introduced in 1989 that likely influenced catch levels of chinook. On January 18, 1989, the size limit was increased from 45 cm to 62 cm for the entire study area (see Appendix C for a definition of the study area). On August 16, 1989, new regulations were instituted which divided the study area into 2 distinct regulation areas. In the area extending from Cadboro Point near Victoria to Sheringham Point near Sooke, the annual bag limit of chinook was increased from 8 to 20 and the size limit was reduced from 62 cm to 45 cm. In the remaining portion of the Strait of Georgia, the annual bag limit was increased from 8 to 15 fish per year but the size limit remained at 62 cm.

The spacial distribution of chinook catch followed a similar pattern to previous years. The highest catches were taken in Area 13 (27% of total), Area 19B+ (25%), and Area 14 (18%) (Table 4, Fig. 8). In 1989, 77% of the chinook landed during the summer months (May - September) were taken in the northern region of Strait of Georgia - Statistical Areas 13 to 17. The opposite was true in the winter months (January - April, October - December) when 73% of the winter catch came from the southern region - Statistical Areas 18, 19, 28 and 29 (Appendix B-3). During November and December, many of the chinook came from Victoria/Sooke waters in Statistical Area 19B+ (Appendix B-3).

The 1989 coho catch of 497,223 pieces (Tables 3 and 4) was less than half of the 1988 catch and represents the lowest coho catch recorded for this fishery since 1984 (Fig. 1, Table 1). Monthly coho catches in 1989 peaked in July which is somewhat later than in 1988 (Fig. 9). Coho catch success in 1989 reached a high of 1.5 fish per boat trip in April, and showed a secondary peak of 1.3 fish per boat trip in July (Fig. 10, Table 5). As in previous years, the highest coho catches were taken in Area 13 (31%) and Area 14 (29%) (Table 4, Fig. 8).

In 1989, Strait of Georgia anglers caught 123,046 pink salmon (Table 3). Significant pink catches were expected in 1989 because pink salmon returns to the Strait of Georgia rivers (primarily the Fraser River) are much higher in odd numbered compared to even numbered years. The highest catches were taken in Area 19B+ (65% of total) and Area 13 (21%) (Table 4).

The landings of other salmon consisted of an estimated 13,356 sockeye and 7,819 chum salmon (Table 3). A large portion of the annual sockeye catch (91% of total) was taken in Areas 19B+, 28 and 29 during July to September (Appendix B-5). Most of the annual catch of chum salmon (71% of total) was taken in Area 13 during September and October (Appendix B-6).

In addition to the above salmon species, an estimated 1,326 steelhead, cutthroat trout and unidentified salmon were caught in the Strait of Georgia in 1989, bringing the total salmonid catch to 775,616 pieces (Appendix B-7).

The average number of salmon caught during each boat trip in 1989 was 1.28 (Table 5). As seen below, this represents the lowest catch success for salmon recorded since 1984.

Year	Catch Success	Reference
1984	1.27	Shardlow and Collicutt (1989 a)
1985	1.69	Shardlow and Collicutt (1989 b)
1986	1.30	Shardlow and Collicutt (1989 c)
1987	1.47	Shardlow and Collicutt (1989 d)
1988	1.86	Shardlow and Collicutt (1989 e)
1989	1.28	This report

In 1989, Areas 14 and 13 showed the highest effort expended while Areas 13 and 19B+ showed the highest total salmon landed (Fig. 11, Table 4). Boaters fishing in Areas 13 and 19B+ had an average catch of 1.7 and 2.0 salmon per trip respectively (Table 4). Area 14 recorded the greatest number of salmon hooked and released (395,227) with Area 13 next at 261,336 (Appendix B-8). These two areas have major coho fisheries characterized by the release of many sub-legal coho.

3.22 Groundfish

While salmon accounted for the majority of the total finfish sport catch in the Strait of Georgia in 1989, the groundfish catch of 313,064 pieces made up 29% of the overall catch (Tables 3 and 4). The species composition of the groundfish catch, based on the Table 4 data, was as follows:

Groundfish Species	Catch	% of Total Groundfish Catch	Major Catch Area
Rockfish (Sebastes spp.)	199,898	64%	16
Lingcod (Ophiodon elongatus)	52,329	17%	13
Dogfish (Squalus acanthias)	3,672	1%	29
Other finfish (Appendix D)	57,165	18%	18
Total	313,064	100%	

The majority of the groundfish catch was taken in the summer months, reflecting the seasonal change in fishing effort (Table 3, Fig. 4). Catch by Statistical Area for rockfish was highest in Area 16 (24% of total, Table 4). Lingcod, as in previous years, were caught in greatest numbers in Area 13 (40% of total), while the largest dogfish catch came from Area 29 (28% of total, Table 4). Area 18 produced the largest catch of other finfish (29%).

Rockfish species were identified for the entire survey area again in 1989 (Table 6). Applying the identification results to the 1989 rockfish catch estimates by area (Table 4) showed the catch by species and area (Table 7). The results are summarized below.

Rockfish Species	Catch	% of Rockfish Catch	Major Catch Area
Quillback	66,510	33%	16
Copper	37,665	19%	18
Yelloweye	10,272	5%	14
Black	3,258	2%	19B+
Other	82,193	41%	16
Total	199,898	100%	

The above "other" rockfish category consisted of tiger, yellowtail, china, canary and unidentified species.

The catch success (CPE) for rockfish was relatively constant throughout the year and averaged 0.3 fish per boat trip, while the catch success for lingcod was 0.1 fish per boat trip (Table 5). The catch success for all non-salmon species and for total finfish during 1989 was 0.5 and 1.8 fish per boat trip respectively (Table 5).

3.3 BIOLOGICAL DATA

3.31 Proportion and Catch of Marked Chinook and Coho

In 1989, 5,674 chinook and 18,801 coho were examined for adipose fin clip marks. Tables 8 and 9 show for chinook and coho respectively, the number of marks observed and

the total fish inspected by month and region. The data were presented by region since some Statistical Areas had insufficient numbers of fish examined for marks in some months, and those data were included with other Areas. Three regions were defined: the North Gulf represented by Areas 13-16; the South Gulf represented by Areas 17, 18, 28, 29 and the Saanich Inlet portion of Area 19 (Area 19A); and the Victoria region represented by the remainder of Area 19 (Area 19B+) (Fig. 2).

Among chinook examined for marks, 4.6% had adipose fin clips. The largest observed proportion of chinook marks was in the South Gulf catch (0.051) and the lowest proportion in the North Gulf catch (0.043) (Table 8). Among coho examined for marks, 5.4% had adipose fin clips. The largest observed proportion of coho marks was in the South Gulf catch (0.069), and the lowest proportion in the Victoria catch (0.039) (Table 9). As in 1988, the above distribution of tags by area was not typical. For example, the largest observed proportion of chinook marks recorded in 1989 was in the South Gulf (Table 8) instead of the North Gulf as reported in 1984 to 1987 (Shardlow and Collicutt 1989 a, b, c and d). Monthly catch estimates of marked chinook and coho are shown by region in Tables 10 and 11 respectively. The seasonal recovery pattern of marked chinook and coho salmon was generally similar to that observed in previous years (Shardlow and Collicutt 1989 b, c and d).

3.32 Catch-At-Age for Chinook

During 1989, 1,567 chinook biosamples were collected for age and length analysis. More samples were collected in 1989 than in previous years because sampling took place during every shift instead of every second shift. Table 12 shows the monthly number and percent age composition of chinook sampled for age. All ages shown in this report represent the total age (freshwater age plus saltwater age). The age data are summarized graphically in Figure 12. The monthly age proportions were applied to the estimated monthly chinook catches to provide a breakdown by age group (Table 13). In 1989, the chinook sport catch in the Strait of Georgia consisted primarily of age 3 fish (83.3%), followed by age 4 fish (10.5%). The age 2 and age 5 or older fish each made up 3.1% of the total. This catch breakdown by age group is similar to the 1985 to 1987 catch data where the majority of chinook caught were age 3, and only a small fraction were age 2 (see below).

Catch Year	% Age Composition of Chinook 2	3	4	5+	Reference
1983	57.1	25.5	14.2	3.1	Shardlow et al. (1989)
1984	21.6	67.3	9.4	1.7	Shardlow and Collicutt (1989 a)
1985	6.6	70.8	20.6	2.0	Shardlow and Collicutt (1989 b)
1986	10.9	44.9	40.4	3.8	Shardlow and Collicutt (1989 c)
1987	7.8	62.1	25.0	5.2	Shardlow and Collicutt (1989 d)
1988	26.4	35.3	35.4	2.8	Shardlow and Collicutt (1989 e)
1989	3.1	83.3	10.5	3.1	This report

The strong age 3 component in 1989 was likely a result of a strong brood year and the influence of the increased size limit (from 45 cm to 62 cm) which eliminated most age 2 chinook from the catch.

Figure 12 and Table 12 show a minor shift in the age composition of sampled chinook, and hence of chinook catch, as the year progressed. Age 3 fish were the dominant component of the catch in all months, with minor peaks of age 4 fish observed from April to June and age 2 fish from September to December.

3.33 Mean Length-At-Age for Chinook

Table 14 shows the monthly mean nose-fork length at age for the 1,567 chinook for which both length and age data were available. Figure 13 shows the length frequency distribution for all the measured chinook (2,075 aged and unaged fish). The largest portion of measured chinook (958 fish or 46% of the total sample) was in the 62-71 cm length category (the basis for using these size categories was the new 62 cm size limit). This is consistent with the large catch of age 3 fish (Table 13) which were found to have an annual mean length of 64.5 cm (Table 14). Of the total chinook measured in 1989 in the new Victoria regulation area, 2% (15 out of 693 sampled fish) were sub-legal in size (less than 45 cm). In the rest of the Strait of Georgia, 20% (281 out of 1382 sampled fish) were sub-legal (less than 62 cm). By comparison, only 2 - 3% of the chinook captured during the 1985 to 1987 surveys were sub-legal (Shardlow and Collicutt 1989 b, c and d). The large number of sub-legal fish observed in the 1989 survey may be attributed to the new 62 cm size limit introduced in much of the survey area. The largest chinook sampled (112.5 cm) was a 4 year old fish landed at Pedder Bay Marina in Area 19 on July 19, 1989.

3.34 Length Frequency Distribution for Coho

Figure 14 shows the length frequency distribution for coho sampled in 1989. Coho length frequency data were omitted in previous reports (1986-1988) and are presented here for comparison (Fig. 15). In 1989, the largest proportion of measured coho (2,862 fish or 42% of the total sample) was in the 50-59 cm length class. This is similar to previous years when 60%, 55% and 53% (1986 to 1988 respectively) of the measured coho were in this size class. The observed trend of a decreasing proportion of fish in the 50-59 cm size class coincides with an increasing proportion of coho in the 40-49 cm size class (21%, 28%, 37% and 34% for 1986 to 1989 respectively). The overall decline in the mean length of coho measured in the creel survey is shown below.

Year	Mean Length (cm)	Sample Size
1986	53.4	5,354
1987	50.5	4,997
1988	50.0	13,000
1989	49.6	6,883

This decline does not appear to be associated with a shift of fishing effort to early spring coho fisheries (Fig. 5).

3.35 Length Frequency Distribution for Lingcod

Figure 16 presents the length frequency distribution for lingcod sampled in 1989. The length frequency data were omitted in previous reports (1985 - 1988) and are shown here for comparison (Fig. 17). In 1989, the largest proportion of measured lingcod (138 fish or 39% of the total sample) was in the 50-59 cm length class. This is similar to previous years when 37%, 42%, 39% and 39% (1985 to 1988 respectively) of the measured lingcod were in this length class.

3.4 BIAS AND ERROR INVESTIGATIONS

In 1989, three projects were undertaken as part of an investigation into potential sources of error and bias in the Strait of Georgia Creel Survey program. The results of two

of these investigations involving data entry errors and early morning fisheries, are summarized below. The third project, involving site selection bias, is still in progress.

3.41 Data Entry Errors

In order to quantify the level of error involved in entering the creel survey interview data, the original interview forms were compared with the key-punched data. The key-punch operator had no prior knowledge that this error check was being made. July 1989 was chosen as one of the busiest months for data entry. Approximately 16 interviews per site were chosen randomly from 39 sites for a total of 618 interviews or 10.9% of the total 5,671 interviews key-punched for July. The original data forms were then manually compared to the data in the computer key-punch file. Any errors found were logged and the type of error noted.

Of the 618 interviews checked, seven (1.1%) had errors. Only one error (improperly coded "number of released chinook") was of a type that could affect catch and release estimates. The other six errors were minor and involved either the date or the interviewer identification code. Based on the above results, it appears that data entry errors are few in number and generally of a type which would have no effect on catch estimates.

3.42 Early Morning Fisheries

To investigate reports of early morning fisheries (boaters landing before the regular start time of 7 a.m. for the creel survey summer shift), a total of 42 shifts from 5 a.m. to 7 a.m. were completed at eight different sites during July and August, 1989. The results are summarized below.

Site	Area	No. shifts	No. Boats Returning At 5-7 a.m.	No. Boats Returning During Regular Shifts
Campbell River Boat Rentals	13	6	0	123
Freshwater Marina	13	7	0	95
Bowser Bill's	14	2	1	46
French Creek Ramp & Marina	17	6	0	142
Brechin Point Ramp	17	7	1	122
Pacific Lions Marina	19	5	0	256
Pedder Bay Marina	19	6	0	267
Sooke Harbour Marina	19	3	0	173
Total		42	2	1,224

Two boats landed between 5 a.m. and 7 a.m. during the 42 early morning shifts sampled. Of these two boats, one was not fishing and the other had no catch to report. It appears from these data that although anglers go out fishing very early in the morning, almost none (2 of 1,224 or 0.2%) actually return before 7 a.m.

4.0 SUMMARY

A sport fishery creel survey was conducted in the Strait of Georgia in 1989 in order to estimate the catches of all the important recreational finfish species and the total sport fishing boat trips. The numbers of chinook and coho salmon with adipose fin clips were also estimated. These data are presented by month and Statistical Area. The age composition of chinook and the length frequency distributions of chinook, coho and lingcod are also shown.

In 1989, sport fishermen made an estimated 603,000 boat trips in the Strait of Georgia. A total of 31,382 boating parties, of which 24,763 were actively fishing, were interviewed at a monthly maximum of 46 landing sites in the Strait of Georgia Creel Survey area. This sampling represents approximately 5% of the total number of boat trips conducted by sport fishermen in the Strait of Georgia in 1989. A total of 68 overflights were also conducted to take "snapshot" counts of fishing effort.

In 1989, sport fishermen in the strait of Georgia landed an estimated total finfish catch of 1,089,000 pieces of which 71% were salmon and 29% were groundfish. The 774,000 landed salmon consisted of 497,000 coho, 133,000 chinook, 123,000 pink salmon, 13,000 sockeye and 8,000 chum salmon. An additional 1,201,000 salmon of mixed species were released by anglers.

The 313,000 landed groundfish consisted of 200,000 rockfish, 52,000 lingcod, 4,000 dogfish and 57,000 other finfish. Rockfish catches were identified as quillback (33% of rockfish catch), copper (19%), yelloweye (5%) and black (2%); the remaining 41% of the rockfish catch consisted of tiger, yellowtail, china, canary and unidentified species.

Catch success per boat trip averaged 1.3 salmon (all species) and 0.5 groundfish.

Among salmon examined for marks, 4.6% of chinook and 5.4% of coho had adipose fin clips. The majority of chinook sport catch in 1989 consisted of age 3 fish (83.3%), followed by age 4 (10.5%) and age 2 and 5 or older (3.1% each). Of the total chinook measured in 1989, 2% were sub-legal in size (less than 45 cm) in the new Victoria regulation area and 20% were sub-legal in size (less than 62 cm) in the remaining portion of the Strait of Georgia. Of the coho and lingcod sampled for length, the largest proportion for both species was in the 50-59 cm size class.

5.0 ACKNOWLEDGMENTS

The authors wish to thank the creel survey staff of LGL Ltd., particularly Karl English, Gary Searing and Jill Peterson, and private marina and boat ramp owners for their valuable assistance and cooperation. We also thank Alice Fedorenko for editing the report and assisting in preparing it for publication, and Peggy Sutherland and Louise Naylor for typing portions of the manuscript.

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FIGURES

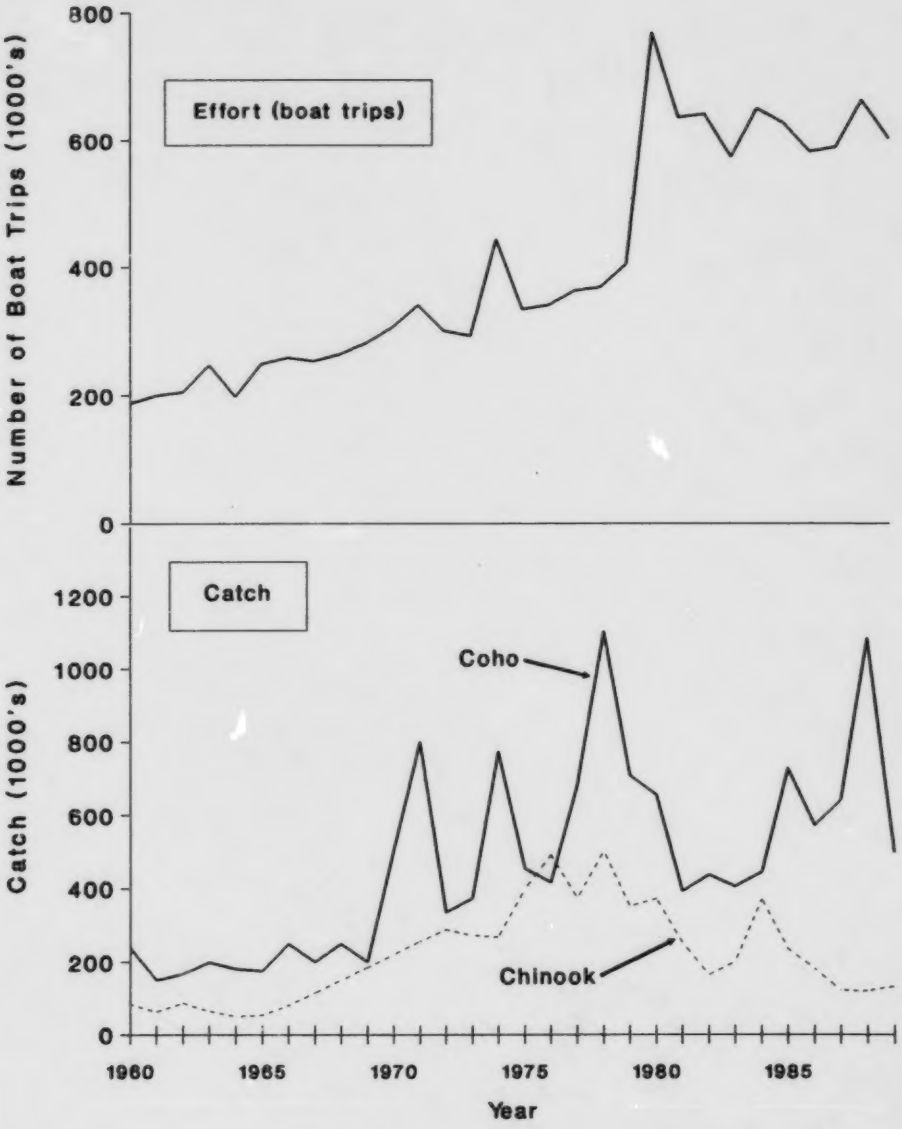


Figure 1. Tidal effort statistics and sport catches of coho and chinook salmon for the Strait of Georgia, 1960 - 1989.

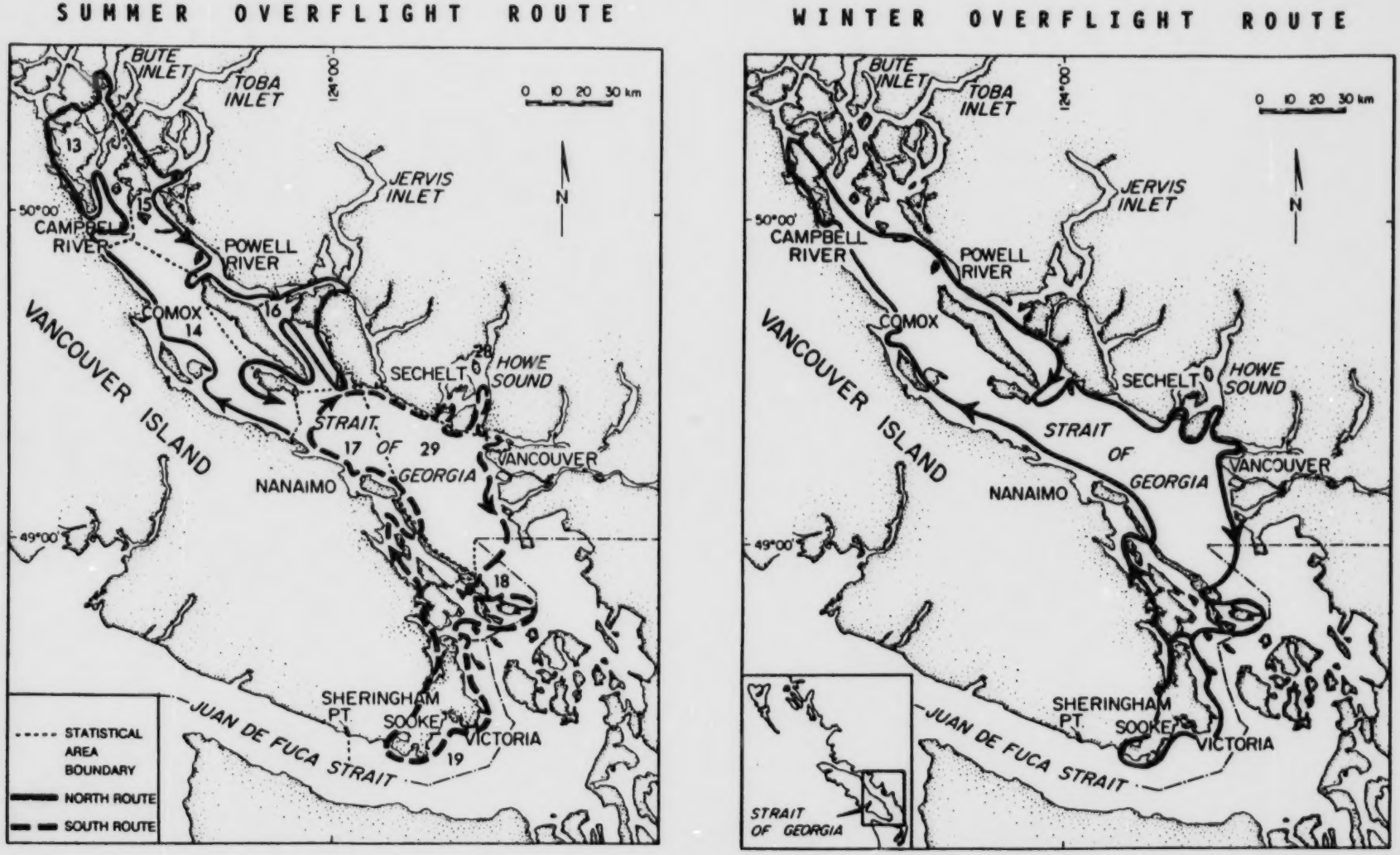


Figure 2. Summer and winter overflight routes, Strait of Georgia, 1989.

GEORGIA STRAIT SPORT FISHING CREEL SURVEY No. 24028

Landing Area: _____/_____ Statistical Area: _____

Interviewer: _____/_____ Date: ____/____/____ (YR. MO. DAY) Time of Interview ___:___ AM PM

PRESENT BOAT TRIP COMPLETED

Assessment Code ☐
0 = Complete Form
1 = Marks Incomplete
3 = Not Visually Inspected
4 = Refusal

1. Total number of individuals in party: ☐
2. Time of landing: ____:____ AM PM Time block: ☐
3. Was your party sport fishing on this trip: YES NO
4. Guided: YES NO
5. Residences of party: B.C. ☐ Rest of Canada ☐ Other ☐
6. Length of boat trip: ☐ HRS.
7. Times lines were in the water: (EXCLUDE time not fishing)

☐ 1) Before 7:00	☐ 5) 10:00 - 10:59	☐ 9) 2:00 - 2:59	☐ 13) 6:00 - 6:59
☐ 2) 7:00 - 7:59	☐ 6) 11:00 - 11:59	☐ 10) 3:00 - 3:59	☐ 14) 7:00 - 7:59
☐ 3) 8:00 - 8:59	☐ 7) 12:00 - 12:59	☐ 11) 4:00 - 4:59	☐ 15) 8:00 - 8:59
☐ 4) 9:00 - 9:59	☐ 8) 1:00 - 1:59	☐ 12) 5:00 - 5:59	☐ 16) 9:00 - Plus

8. Average number of lines in the water for TOTAL boat party: ☐
9. CATCH SUMMARY

	1ST SUB AREA	2ND SUB AREA	3RD SUB AREA
GO TO MAP:			
KEPT:			
RELEASED:			
TIME:	HRS.	HRS.	HRS.

Total catch for trip: ☐

Total time fishing: ☐ HRS.

MARKS

	ADIPOSE MISSING	UNMARKED
CHINOOK	☐	☐
COHO	☐	☐

10. How much fishing time was directed at each of the following?

CO ☐ CN ☐ SM ☐ LC ☐ RF ☐
GF ☐ SF ☐ OTHER ☐

11. Angler salmon species identification:

COHO	CHINOOK	PINK	SOCKEYE
☐	☐	☐	☐

24028

Figure 3. Sample of 1989 interview form.

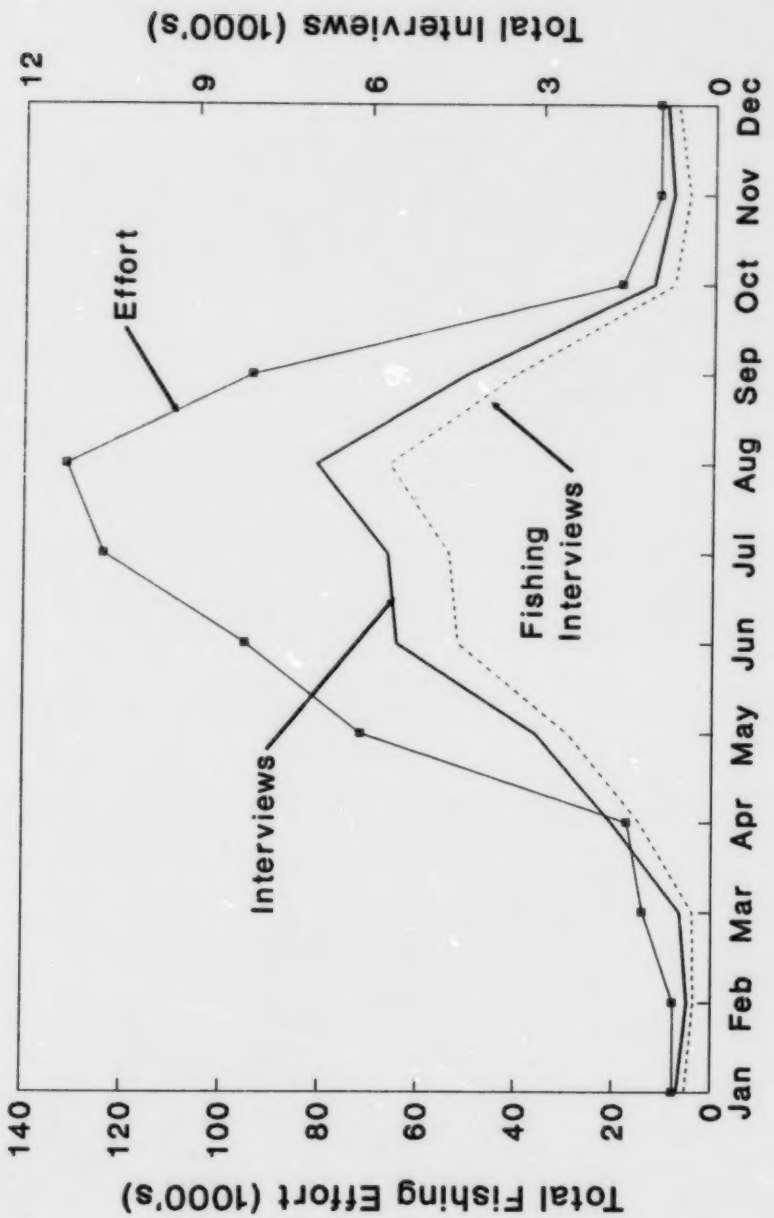


Figure 4. Comparison of monthly total fishing effort, monthly total interviews and monthly total fishing interviews, Strait of Georgia, 1989.

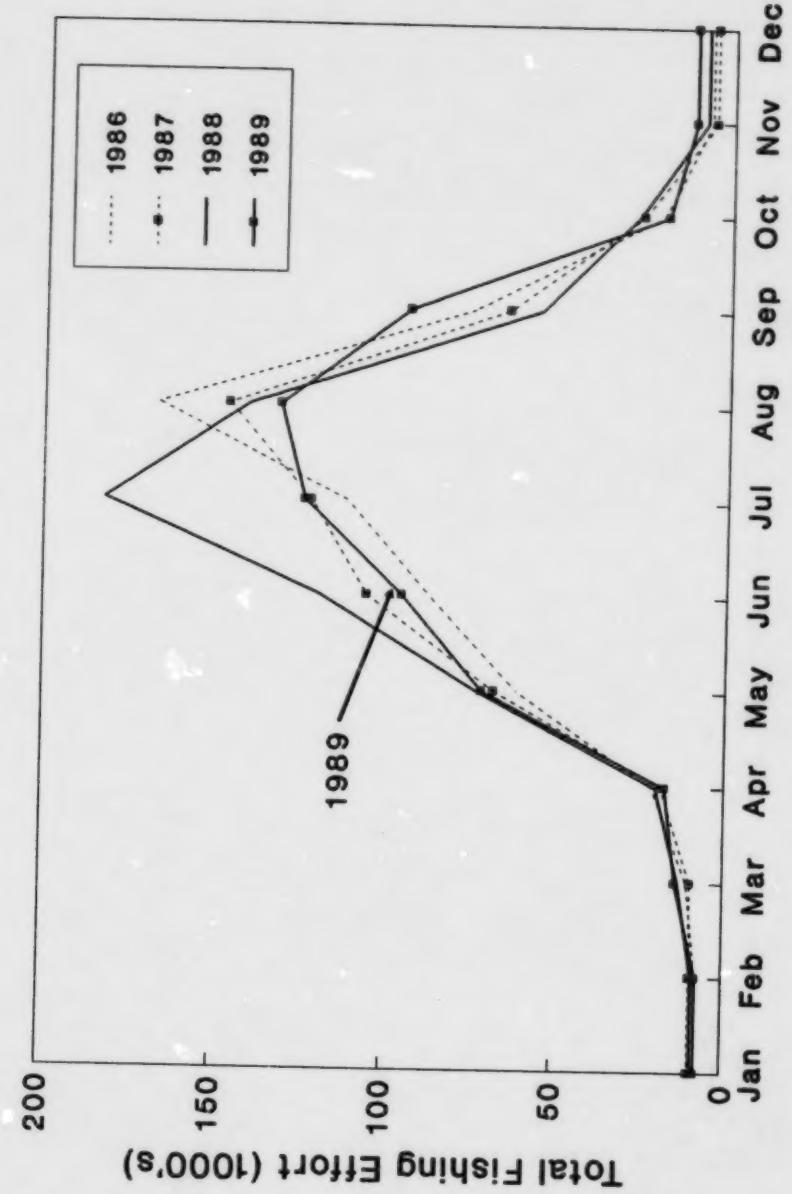


Figure 6. Monthly fishing effort estimates (number of boat trips) for the Strait of Georgia sport fishery, 1986 - 1989.

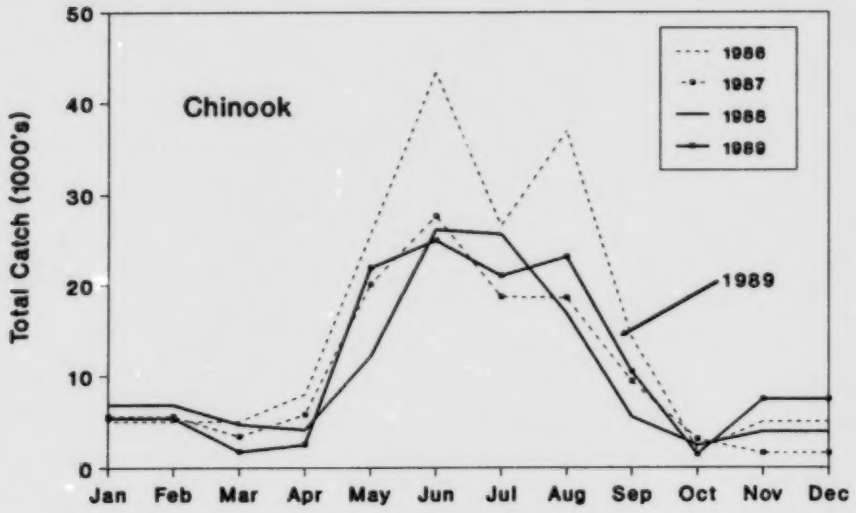


Figure 6. Monthly chinook catch for the Strait of Georgia sport fishery, 1986 - 1989.

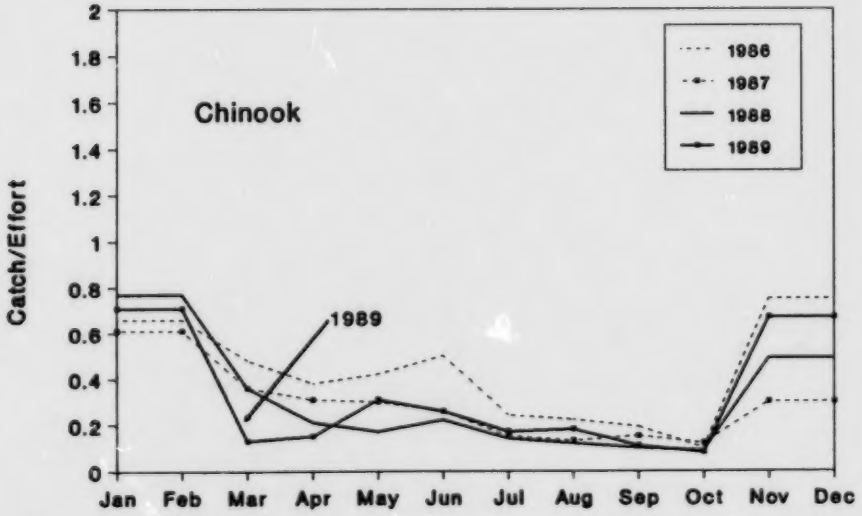


Figure 7. Monthly chinook catch per boat trip for the Strait of Georgia sport fishery, 1986 - 1989.

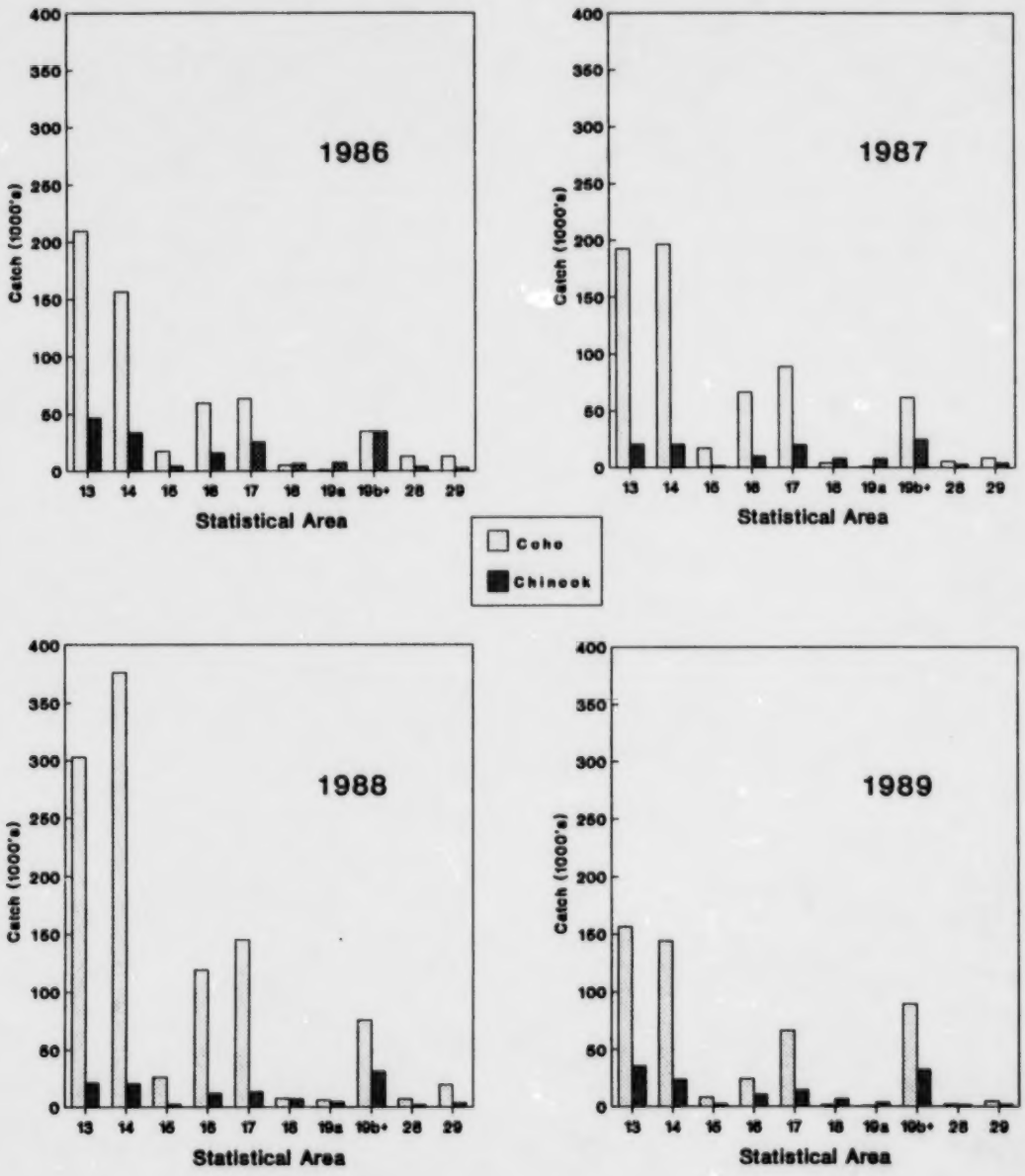


Figure 8. Annual sport catches of chinook and coho salmon by Statistical Area in the Strait of Georgia, 1986 - 1989.

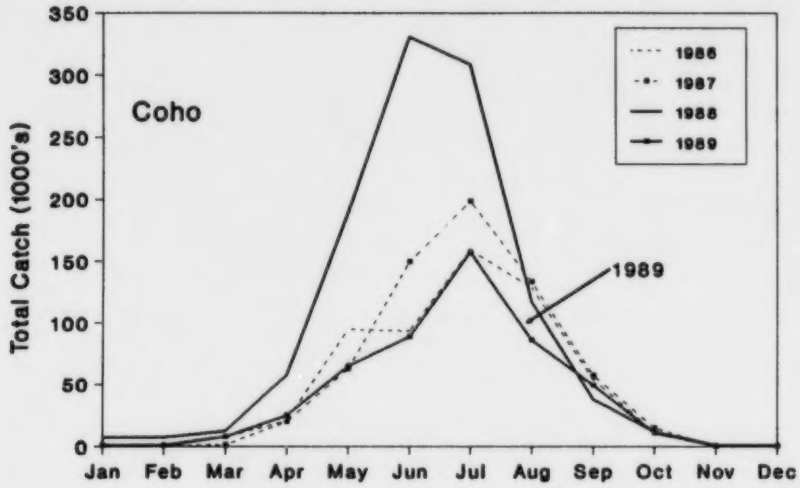


Figure 9. Monthly coho catch for the Strait of Georgia sport fishery, 1986 - 1989.

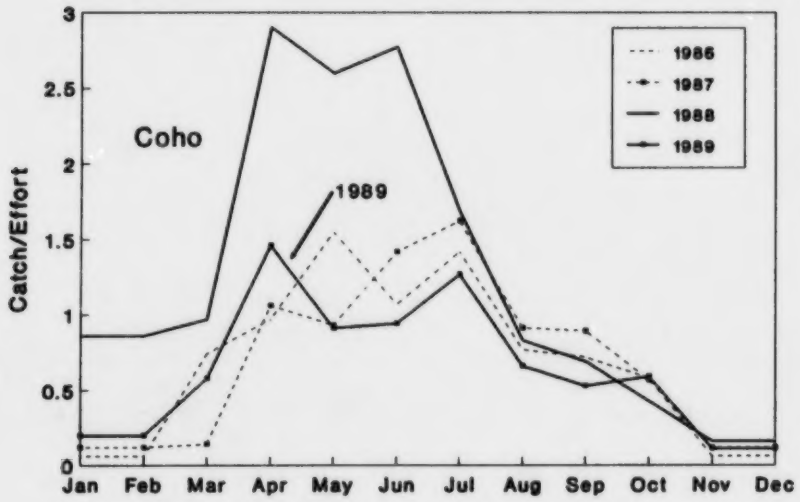


Figure 10. Monthly coho catch per boat trip for the Strait of Georgia sport fishery, 1986 - 1989.

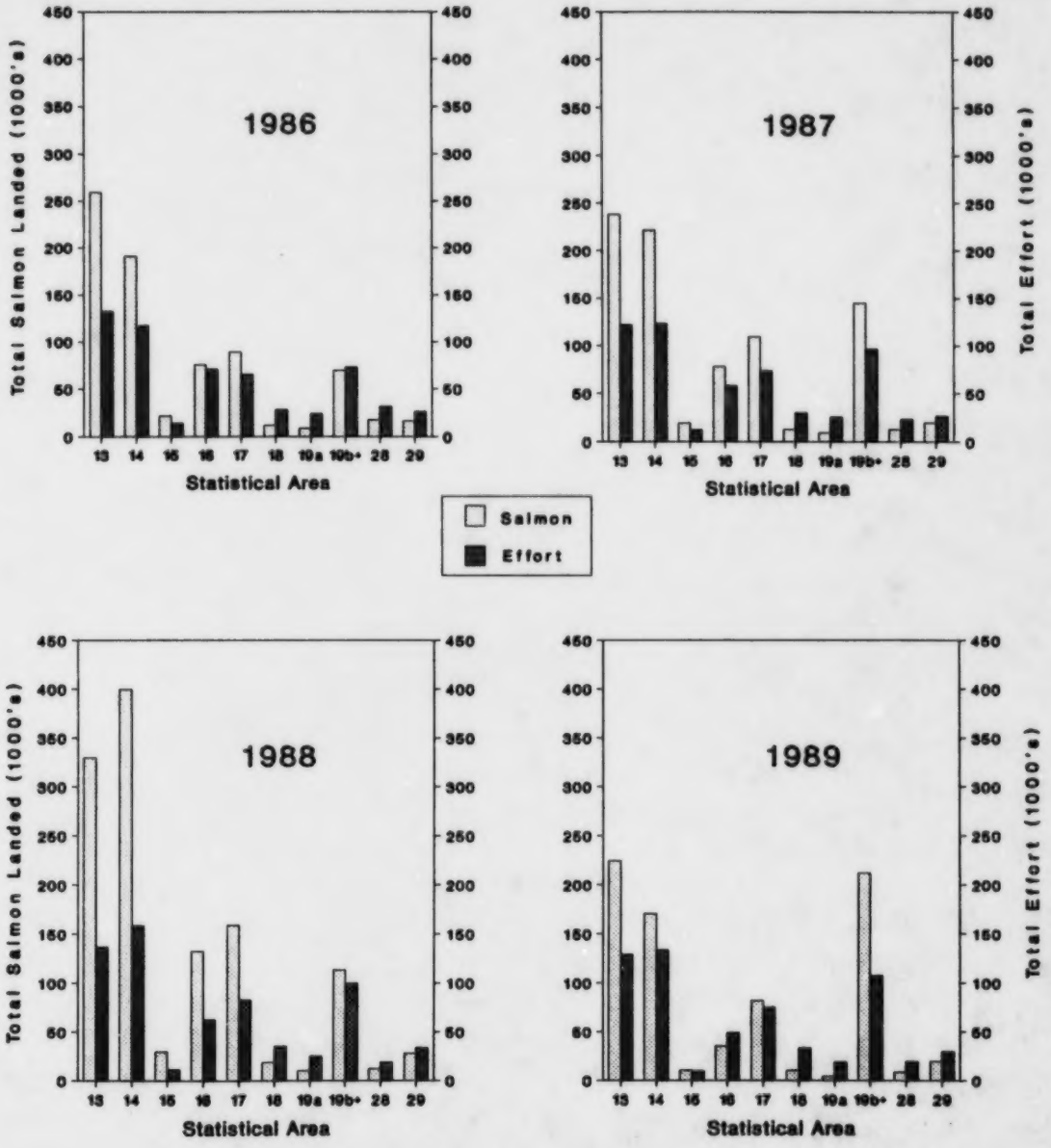


Figure 11. Total salmon landed and total fishing effort expended by Statistical Area in the Strait of Georgia sport fishery, 1986 - 1989.

Figure 12. Monthly percent age composition of chinook salmon sampled in the Strait of Greorgia Creel Survey, 1989.

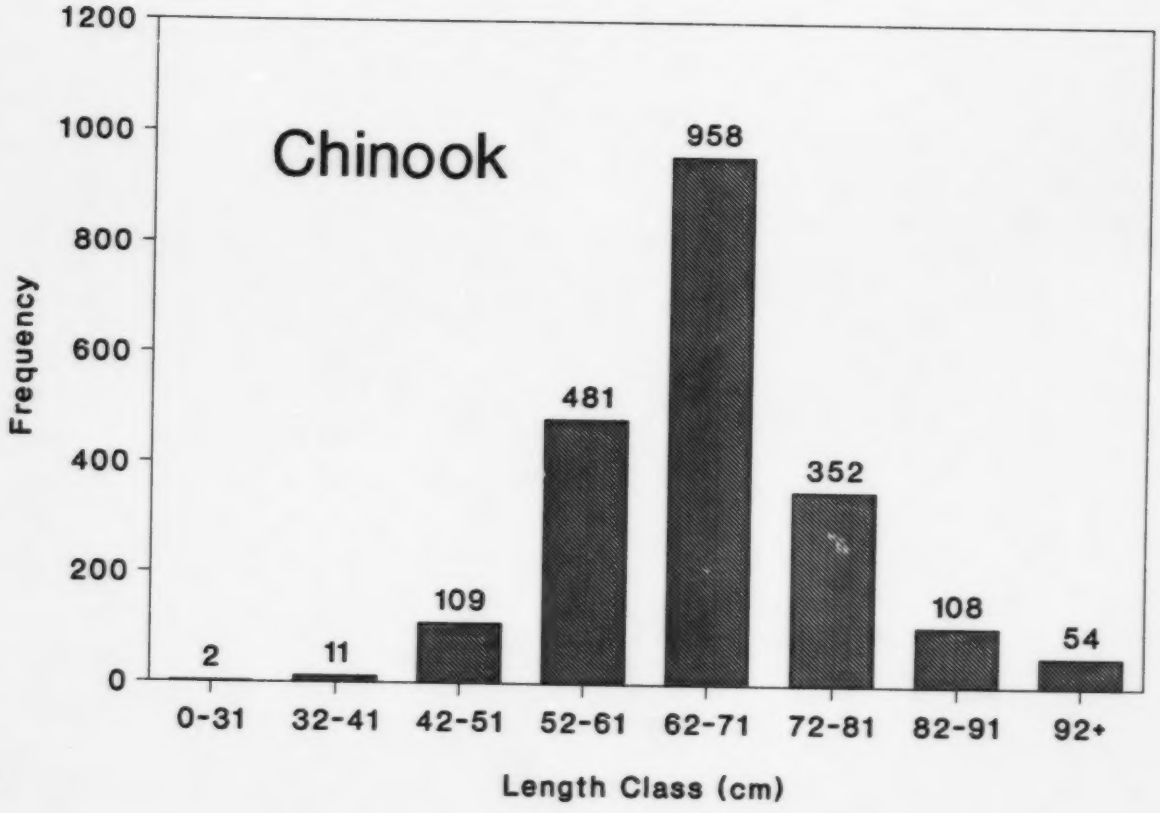


Figure 13. Length frequency distribution of chinook salmon sampled in the Strait of Georgia Creel Survey, 1989.

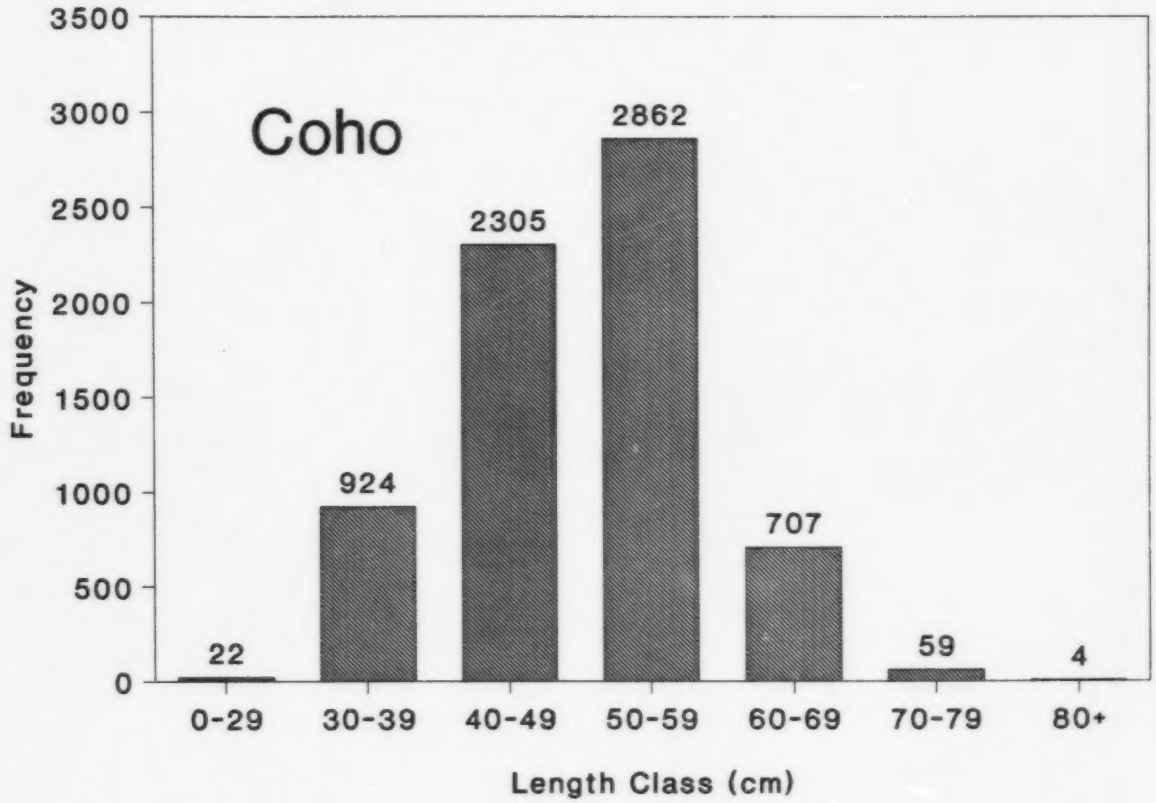


Figure 14. Length frequency distribution of coho salmon sampled in the Strait of Georgia Creel Survey, 1989.

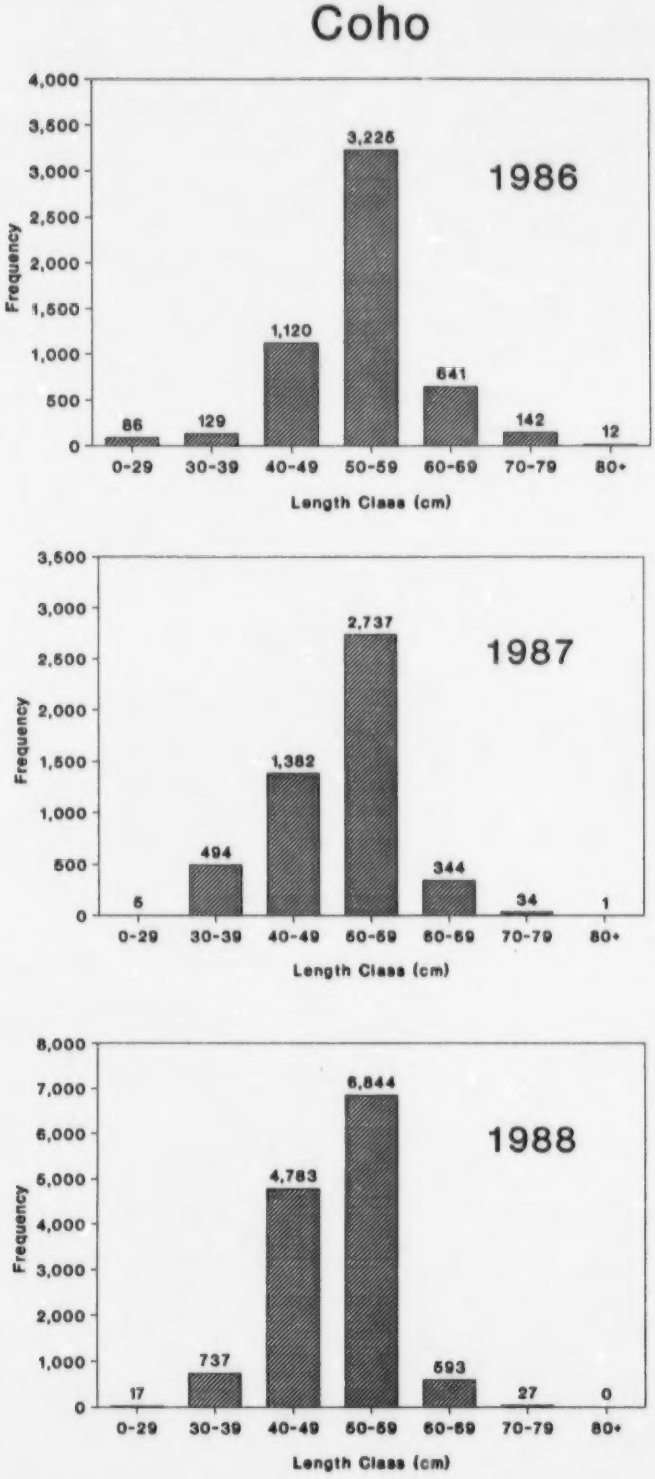


Figure 15. Length frequency distribution of coho salmon sampled in the Strait of Georgia Creel Survey, 1986 -1988.

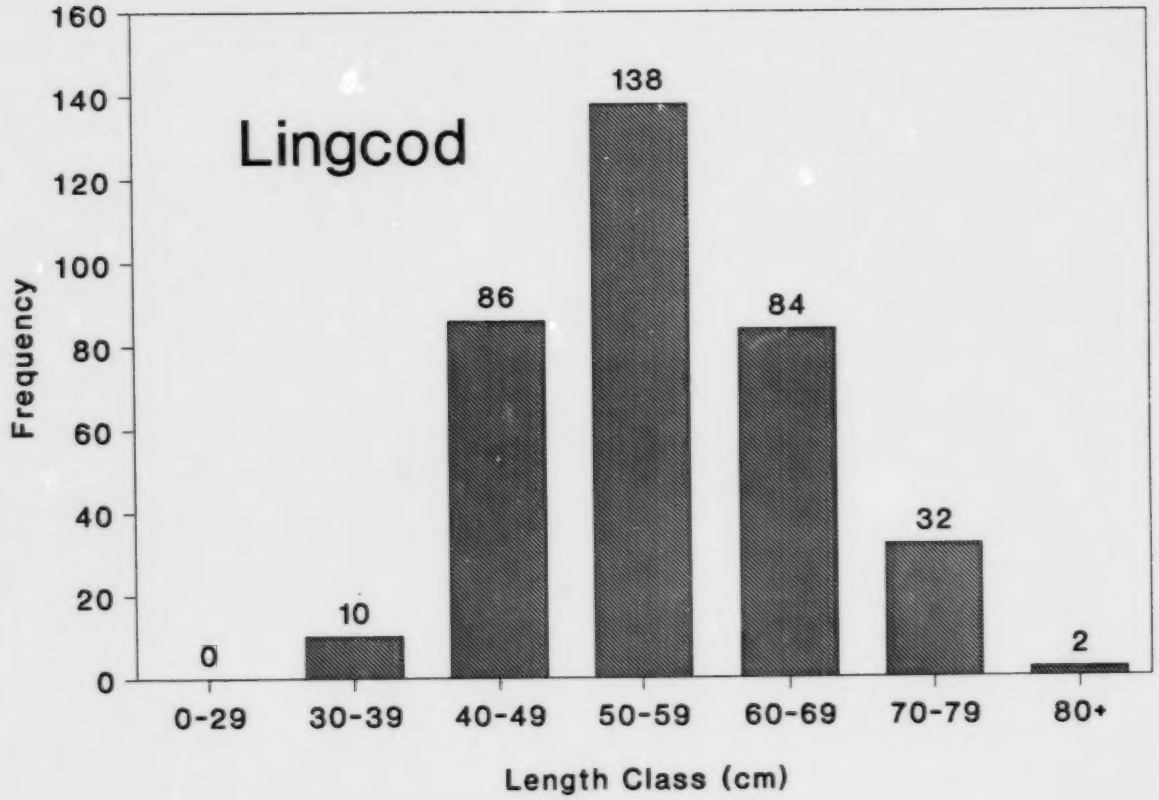
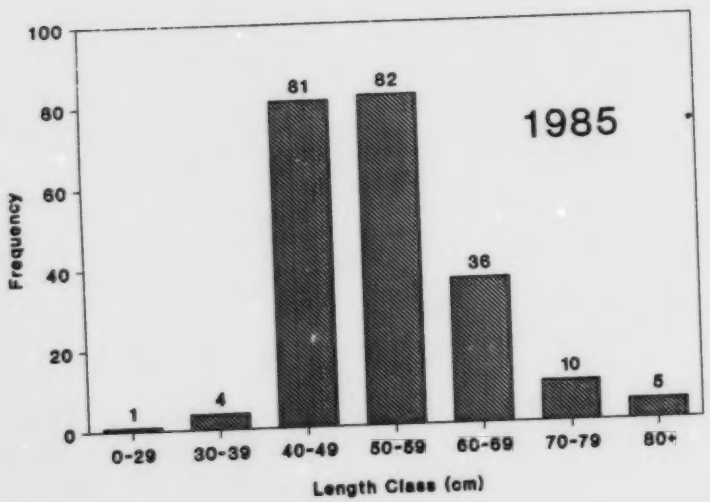
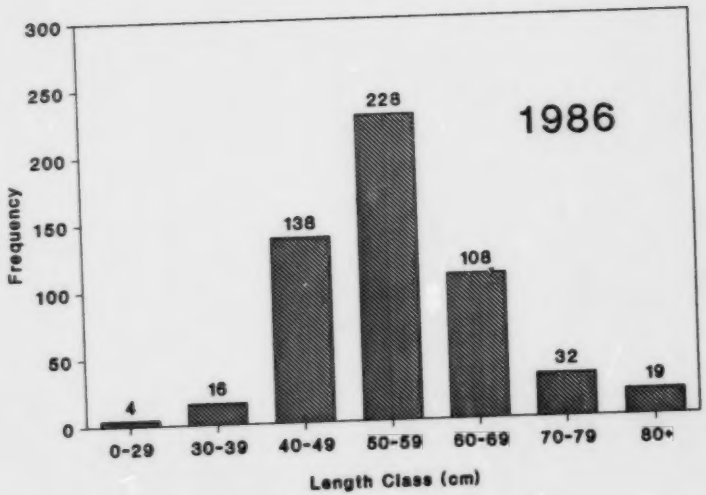
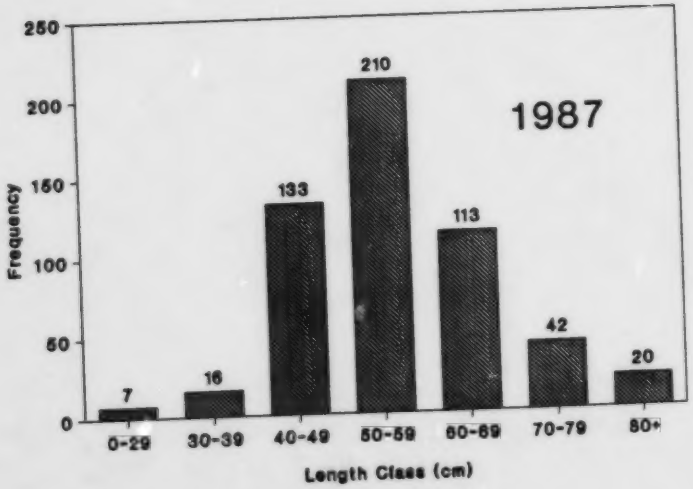


Figure 16. Length frequency distribution of lingcod sampled in the Strait of Georgia Creel Survey, 1989.

Lingcod







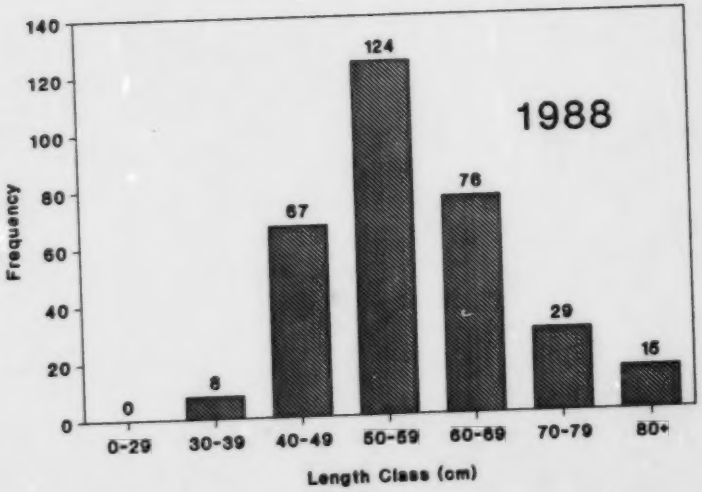


Figure 17. Length frequency distribution of lingcod sampled in the Strait of Georgia Creel Survey, 1985 - 1988.

TABLES

Table 1. Tidal effort statistics and sport catches of coho and chinook salmon for the Strait of Georgia, 1960 -1989.*

Year	Effort (boat trips)	Catch	
		Coho	Chinook
1960	189,150	238,000	83,000
1961	199,935	152,000	63,000
1962	205,547	167,000	86,000
1963	247,590	199,000	65,000
1964	198,120	182,000	51,000
1965	250,020	175,000	53,000
1966	259,100	249,000	80,000
1967	254,500	200,000	115,000
1968	265,030	250,000	150,000
1969	281,475	200,000	185,000
1970	306,255	500,000	220,000
1971	341,123	800,000	255,000
1972	300,349	335,000	287,000
1973	293,141	373,000	272,000
1974	443,441	772,000	269,000
1975	334,490	454,000	398,000
1976	340,729	415,000	490,000
1977	363,350	682,000	372,000
1978	369,035	1,103,000	500,000
1979	404,710	708,735	350,000
1980	769,000	655,000	371,000
1981	637,000	391,200	253,300
1982	642,200	436,090	163,793
1983	574,257	404,031	198,433
1984	651,090	443,590	369,445
1985	628,513	728,197	234,838
1986	582,946	571,980	181,896
1987	589,731	641,572	121,081
1988	664,517	1,084,790	119,117
1989	603,331	497,223	132,846

* **SOURCE:** Coho catch statistics: 1960–1978 from Argue et al. (1983), 1979 from R.Kadowaki (pers. comm.), 1980–1982 from Shardlow et al. (MS 1989), 1983 from Shardlow et al. (1989), 1984 to 1988 from Shardlow and Collicutt (1989 a, b, c, d and e).
Chinook catch statistics: 1960–1977 from Argue et al. (1983), 1978 and 1979 from B.Riddell (pers. comm.) following the methods of Argue et al. (1983), 1980–1982 from Shardlow et al. (MS 1989), 1983 from Shardlow et al. (1989), 1984 to 1988 from Shardlow and Collicutt (1989 a, b, c, d and e).
Effort statistics: 1960–1979 from annual published and unpublished Fisheries Officer statistics, 1980–1982 from Shardlow et al. (MS 1989), 1983 from Shardlow et al. (1989), 1984 to 1988 from Shardlow and Collicutt (1989 a, b, c, d and e).

Table 2. Number of fishing interviews by month and Statistical Area, and number of overflights by month, Strait of Georgia, 1989.

	Statistical Area											
Month	13	14	15	16	17	18	19A	19B+	28	29	Total	Over-flights
Jan+Feb	8	39	0	213	65	13	6	316	49	37	746	4
Mar	4	19	0	97	70	6	8	76	30	13	323	4
Apr	17	234	0	250	222	20	13	343	83	35	1,217	4
May	252	405	69	368	563	38	106	380	265	74	2,520	7
Jun	686	1,116	179	570	468	50	113	907	226	122	4,437	10
Jul	876	843	153	515	399	67	104	1,150	241	258	4,606	11
Aug	1,383	857	96	535	446	71	49	1,514	270	422	5,643	10
Sep	416	556	59	224	319	94	60	1,286	173	269	3,456	8
Oct	7	71	0	36	124	55	17	310	71	13	704	6
Nov+Dec	9	37	0	179	91	34	21	632	66	42	1,111	4
Total	3,658	4,177	556	2,987	2,767	448	497	6,914	1,474	1,285	24,763	68

Table 3. Fishing effort and catch by species and month, Strait of Georgia, 1989.

Month		Effort No. Boat Trips	Coho	Chinook	Pink	Sockeye	Chum	Rock-Fish	Lingcod	Dog-Fish	Other Finfish	Total Finfish
Jan+Feb	Estimate	15,319	3,102	10,845	0	0	0	3,602	19 *	7	13,142	30,717
	S.E.	2,257	916	2,730	0	0	0	773	14	5	6,514	7,164
Mar	Estimate	13,913	8,070	1,774	0	0	0	3,612	209 *	0	5,786	19,451
	S.E.	1,655	2,111	428	0	0	0	1,179	143	0	2,621	3,594
Apr	Estimate	17,206	25,072	2,512	19	0	0	5,004	275	14	1,279	34,175
	S.E.	1,418	4,445	394	25	0	0	645	105	9	251	4,517
May	Estimate	71,494	65,000	21,895	284	0	28	29,134	8,130	473	4,054	128,998
	S.E.	5,547	8,326	2,470	78	0	25	3,008	1,096	201	486	9,271
Jun	Estimate	95,167	89,244	24,914	703	296	0	37,501	10,047	1,351	5,011	169,067
	S.E.	4,348	6,094	1,448	118	126	0	2,818	790	364	549	6,947
Jul	Estimate	123,871	157,563	21,019	12,474	4,567	112	40,666	10,026	859	5,562	252,848
	S.E.	4,211	8,073	1,155	1,317	637	50	2,809	853	284	567	8,813
Aug	Estimate	131,383	86,359	23,080	35,800	6,879	73	37,153	9,958	582	8,302	208,186
	S.E.	4,901	4,369	1,281	2,766	616	37	2,583	761	155	1,038	6,092
Sep	Estimate	93,847	49,389	10,457	73,579	1,603	3,116	26,922	7,789	225	6,431	179,511
	S.E.	3,851	3,143	862	7,283	248	401	2,241	855	74	1,478	8,475
Oct	Estimate	18,757	11,071	1,461	187	11	3,210	7,452	4,024	161	4,190	31,767
	S.E.	1,909	2,424	281	59	12	1,870	2,077	2,544	128	982	4,607
Nov+Dec	Estimate	22,374	2,353	14,889	0	0	1,280	8,852	1,852 *	0	3,408	32,634
	S.E.	1,762	493	1,567	0	0	854	1,852	931	0	1,045	2,969
Total	Estimate	603,331	497,223	132,846	123,046	13,356	7,819	199,898	52,329	3,672	57,165	1,087,354 **
	S.E.	11,084	15,224	4,716	7,903	929	2,096	6,835	3,352	547	7,453	20,869

* A total closure for lingcod was in effect from January 1 to April 15, and November 15 to December 31. Reported figures most likely represent illegal catches by anglers.

** In addition, an estimated 1,326 steelhead, cutthroat trout, and unidentified salmon were caught by sport fishermen.

Table 4. Fishing effort and catch by species and Statistical Area, Strait of Georgia, 1989.

Statistical Area		Effort No. Boat Trips	Coho	Chinook	Pink	Sockeye	Chum	Rock-Fish	Lingcod	Dog-Fish	Other Finfish	Total Finfish
13	Estimate	128,697	156,331	35,759	26,015	493	5,680	18,777	20,905	160	3,870	267,990
	S.E.	5,293	7,644	1,792	2,658	134	1,908	2,311	2,879	46	628	9,295
14	Estimate	133,622	143,868	23,683	2,041	63	361	31,837	8,629	229	6,263	216,974
	S.E.	5,910	8,075	2,333	242	25	122	2,996	868	161	1,518	9,098
15	Estimate	9,427	7,842	2,309	110	7	0	3,110	799	22	564	14,763
	S.E.	880	933	292	35	4	0	411	120	7	120	1,075
16	Estimate	48,904	24,606	10,316	54	1	0	48,461	7,454	403	5,470	96,765
	S.E.	2,078	1,861	855	17	1	0	3,138	632	212	593	3,852
17	Estimate	74,793	66,648	14,581	636	8	43	33,649	4,763	147	4,574	125,049
	S.E.	3,722	8,155	1,192	95	5	20	3,000	622	67	603	8,814
18	Estimate	32,877	1,367	6,317	1,075	335	1,179	19,903	2,990	279	16,633	50,078
	S.E.	1,889	221	797	265	75	852	2,518	938	108	6,805	7,418
19A	Estimate	18,910	716	3,330	55	0	0	4,992	693	81	1,854	11,721
	S.E.	2,541	310	709	60	0	0	1,123	291	117	732	1,580
19B+	Estimate	107,414	89,427	32,539	79,668	9,131	256	24,184	5,021	388	14,016	254,630
	S.E.	5,055	6,073	3,167	7,353	842	73	2,152	638	95	2,266	10,577
28	Estimate	19,418	1,909	1,782	3,651	1,063	89	5,936	319	924	1,763	17,436
	S.E.	1,710	293	337	587	209	34	710	90	271	267	1,116
29	Estimate	29,269	4,509	2,230	9,741	2,255	211	9,049	756	1,039	2,158	31,948
	S.E.	1,568	422	253	912	294	59	801	110	338	265	1,415
Total	Estimate	603,331	497,223	132,846	123,046	13,356	7,819	199,898	52,329	3,672	57,165	1,087,354 *
	S.E.	11,084	15,224	4,716	7,903	929	2,096	6,835	3,352	547	7,453	20,869

* In addition, an estimated 1,326 steelhead, cutthroat trout and unidentified salmon were caught by sport fishermen.

Table 5. Monthly catch success (catch per boat trip) by species, Strait of Gerogia, 1989.*

Month	Chinook	Coho	Total ** Salmon	Rock-Fish	Lingcod	Total Non-Salmon	All Finfish
Jan+Feb	0.71	0.20	0.91	0.24	0.00	1.09	2.01
Mar	0.13	0.58	0.71	0.26	0.02	0.69	1.40
Apr	0.15	1.46	1.60	0.29	0.02	0.38	1.99
May	0.31	0.91	1.22	0.41	0.11	0.58	1.80
Jun	0.26	0.94	1.21	0.39	0.11	0.57	1.78
Jul	0.17	1.27	1.58	0.33	0.08	0.46	2.04
Aug	0.18	0.66	1.16	0.28	0.08	0.43	1.58
Sep	0.11	0.53	1.47	0.29	0.08	0.44	1.91
Oct	0.08	0.59	0.85	0.40	0.21	0.84	1.69
Nov+Dec	0.67	0.11	0.83	0.40	0.08	0.63	1.46
Total	0.22	0.82	1.28	0.33	0.09	0.52	1.80

* Calculated using Table 3 data.

** Includes coho, chinook, pink, chum and sockeye.

Table 6. Identification of rockfish by species in each Statistical Area, Strait of Georgia, 1989.

Species	Statistical Area										Total Sample
	13	14	15	16	17	18	19A	19B+	28	29	
Quillback (Sebastes maliger)	176	189	101	847	159	64	109	659	215	20	2,539
Copper (S. caurinus)	98	118	10	201	140	111	21	296	207	28	1,230
Yelloweye (S. ruberrimus)	47	65	10	87	24	0	14	63	13	0	323
Black (S. melanops)	0	1	0	3	2	3	5	167	24	0	205
Tiger (S. nigrocinctus)	3	3	2	14	6	1	7	4	1	0	41
Yellowtail (S. flavidus)	0	0	0	1	0	0	0	54	0	0	55
China (S. nebulosus)	0	1	0	4	0	0	3	6	0	0	14
Canary (S. pinniger)	0	0	0	0	1	1	4	63	12	1	82
Unidentified	73	249	63	919	356	111	58	273	351	154	2,607
Total sample	397	626	186	2,076	688	291	221	1,585	823	203	7,096

Table 7. Estimated catch of rockfish by species and Statistical Area, Strait of Georgia, 1989. +

Species		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Quillback	Catch	8,324	9,612	1,689	19,772	7,776	4,377	2,462	10,055	1,551	892	66,510
	S.D.	1,128	1,078	251	1,383	881	738	580	944	207	206	2,654
Copper	Catch	4,635	6,001	167	4,692	6,847	7,592	474	4,516	1,493	1,248	37,665
	S.D.	702	754	56	438	801	1,118	147	467	200	246	1,868
Yelloweye	Catch	2,223	3,306	167	2,031	1,174	0	316	961	94	0	10,272
	S.D.	411	499	56	251	258	0	110	147	28	0	765
Black	Catch	0	51	0	70	98	205	113	2,548	173	0	3,258
	S.D.	0	51	0	41	70	122	57	294	41	0	340
Other *	Catch	3,595	12,867	1,087	21,896	17,754	7,729	1,627	6,104	2,625	6,909	82,193
	S.D.	1,846	2,645	316	2,771	2,741	2,129	942	1,848	647	734	5,956
Total	Catch	18,777	31,837	3,110	48,461	33,649	19,903	4,992	24,184	5,936	9,049	199,898
	S.D.	2,311	2,996	411	3,138	3,000	2,518	1,123	2,152	710	801	6,835

+ Calculated using data from Table 6 and Appendix B-9.

* Other includes tiger, yellowtail, china, canary, and unidentified rockfish.

Table 8. Monthly number of marked chinook observed and total chinook inspected by region, Strait of Georgia, 1989.

Month		North Gulf	South Gulf	Victoria	Total Sample
Jan+Feb	Obs *	7	0	24	31
	Insp **	198	71	327	596
Mar	Obs	1	0	0	1
	Insp	49	14	4	67
Apr	Obs	4	2	2	8
	Insp	97	89	30	216
May	Obs	18	11	3	32
	Insp	416	170	81	667
Jun	Obs	39	8	11	58
	Insp	756	134	242	1,132
Jul	Obs	17	5	6	28
	Insp	443	113	201	757
Aug	Obs	21	11	7	39
	Insp	546	133	191	870
Sep	Obs	8	3	6	17
	Insp	144	68	118	330
Oct	Obs	0	0	0	0
	Insp	8	18	39	65
Nov+Dec	Obs	4	5	38	47
	Insp	94	71	809	974
Total	Obs	119	45	97	261
	Insp	2,751	881	2,042	5,674
Proportion of marks		0.043	0.051	0.048	0.046

* Obs - marks observed.

** Insp - fish inspected.

Table 9. Monthly number of marked coho observed and total coho inspected by region, Strait of Georgia, 1989.

Month		North Gulf	South Gulf	Victoria	Total Sample
Jan+Feb	Obs *	4	0	0	4
	Insp **	34	22	70	126
Mar	Obs	4	2	9	15
	Insp	48	37	46	131
Apr	Obs	39	26	12	77
	Insp	722	588	319	1,629
May	Obs	39	122	5	166
	Insp	519	1,603	133	2,255
Jun	Obs	178	29	7	214
	Insp	3,112	497	146	3,755
Jul	Obs	202	2	77	281
	Insp	3,366	129	2,227	5,722
Aug	Obs	100	20	30	150
	Insp	2,274	249	653	3,176
Sep	Obs	48	18	20	86
	Insp	891	118	433	1,442
Oct	Obs	5	5	15	25
	Insp	58	20	397	475
Nov+Dec	Obs	0	1	2	3
	Insp	8	7	75	90
Total	Obs	619	225	177	1,021
	Insp	11,032	3,270	4,499	18,801
Proportion of marks		0.056	0.069	0.039	0.054

* Obs - marks observed.

** Insp - fish inspected.

Table 10. Monthly estimated catch of marked chinook by region, Strait of Georgia, 1989. *

Month		North Gulf	South Gulf	Victoria	Total Sample
Jan+Feb	Catch	70	0	472	542
	S.D.	32	0	218	220
Mar	Catch	16	0	0	16
	S.D.	18	0	0	18
Apr	Catch	32	31	24	87
	S.D.	20	23	18	35
May	Catch	649	354	53	1,056
	S.D.	182	116	33	218
Jun	Catch	805	312	185	1,302
	S.D.	137	116	64	191
Jul	Catch	512	177	110	799
	S.D.	126	83	46	158
Aug	Catch	657	287	93	1,037
	S.D.	147	96	36	179
Sep	Catch	331	122	88	541
	S.D.	121	72	39	146
Oct	Catch	0	0	0	0
	S.D.	0	0	0	0
Nov+Dec	Catch	59	176	517	752
	S.D.	33	89	106	142
Total	Catch	3,131	1,459	1,542	6,132
	S.D.	327	238	263	482

* Calculated using data from Table 8 and Appendix B-3.

Table 11. Monthly estimated catch of marked coho by region, Strait of Georgia, 1989. *

Month		North Gulf	South Gulf	Victoria	Total Sample
Jan+Feb	Catch	131	0	0	131
	S.D.	102	0	0	102
Mar	Catch	224	50	872	1,146
	S.D.	131	38	474	493
Apr	Catch	607	410	172	1,189
	S.D.	233	121	55	268
May	Catch	1,606	3,157	80	4,843
	S.D.	334	653	47	735
Jun	Catch	4,512	495	90	5,097
	S.D.	473	121	38	490
Jul	Catch	6,369	54	1,657	8,080
	S.D.	575	39	256	631
Aug	Catch	3,123	497	420	4,040
	S.D.	359	115	85	386
Sep	Catch	1,925	592	451	2,968
	S.D.	311	143	117	362
Oct	Catch	348	128	247	723
	S.D.	216	60	92	242
Nov+Dec	Catch	0	58	41	99
	S.D.	0	68	31	75
Total	Catch	18,845	5,441	4,030	28,316
	S.D.	1,010	707	572	1,359

* Calculated using data from Table 9 and Appendix B-2.

Table 12. Monthly number and percent age composition of chinook sampled for age in the Strait of Georgia Creel Survey, 1989 (n gives sample size).

Month	Age 2		Age 3		Age 4		Age 5+		Total Sample
	n	%	n	%	n	%	n	%	
Jan+Feb	0	0.0%	86	91.5%	6	6.4%	2	2.1%	94
Mar	0	0.0%	21	87.5%	1	4.2%	2	8.3%	24
Apr	0	0.0%	77	80.2%	18	18.8%	1	1.0%	96
May	2	1.2%	123	73.2%	35	20.8%	8	4.8%	168
Jun	0	0.0%	193	77.5%	39	15.7%	17	6.8%	249
Jul	5	2.9%	150	86.7%	13	7.5%	5	2.9%	173
Aug	7	2.0%	304	88.4%	28	8.1%	5	1.5%	344
Sep	8	8.5%	82	87.2%	4	4.3%	0	0.0%	94
Oct	2	7.7%	22	84.6%	2	7.7%	0	0.0%	26
Nov+Dec	37	12.4%	258	86.3%	4	1.3%	0	0.0%	299
Total	61	-	1,316	-	150	-	40	-	1,567
Overall age composition of catch *	-	3.1%	-	83.3%	-	10.5%	-	3.1%	-

* Overall age composition of estimated catch based on data from Table 13.

Table 13. Monthly estimated catch at age of chinook in the Strait of Georgia, 1989. *

Month		Age 2	Age 3	Age 4	Age 5+	Total **
Jan+Feb	Catch	0	9,922	692	231	10,845
	S.D.	0	2,519	332	176	2,730 ++
Mar	Catch	0	1,552	74	148	1,774
	S.D.	0	394	77	109	428 ++
Apr	Catch	0	2,015	471	26	2,512
	S.D.	0	333	125	27	394 ++
May	Catch	261	16,030	4,561	1,043	21,895
	S.D.	187	1,959	861	381	2,470 ++
Jun	Catch	0	19,311	3,902	1,701	24,914
	S.D.	0	1,303	618	411	1,448 ++
Jul	Catch	607	18,226	1,579	607	21,019
	S.D.	270	1,140	431	270	1,155 ++
Aug	Catch	470	20,396	1,879	335	23,080
	S.D.	178	1,200	356	150	1,281 ++
Sep	Catch	890	9,122	445	0	10,457
	S.D.	311	834	222	0	862 ++
Oct	Catch	112	1,237	112	0	1,461
	S.D.	81	260	81	0	281 ++
Nov+Dec	Catch	1,842	12,848	199	0	14,889
	S.D.	345	1,385	102	0	1,567 ++
Total	Catch	4,182	110,659	13,914	4,091	132,846
	S.D.	602	4,191	1,278	673	4,716 ++
Overall age composition		3.1%	83.3%	10.5%	3.1%	100.0%

* Calculated by applying to the total monthly chinook catch the monthly age proportions from Table 12.

** Monthly total catch and S.E. from Table 3.

++ S.E.

Table 14. Monthly mean nose-fork length (L) at age of chinook sampled in the Strait of Georgia Creel Survey, 1989 (n gives sample size).

	Age 2		Age 3		Age 4		Age 5		Age 6		Total
Month	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	Sample
Jan+Feb	-	0	54.0	86	62.3	6	72.0	2	-	0	94
Mar	-	0	61.3	21	80.0	1	86.0	1	90.0	1	24
Apr	-	0	61.6	77	72.1	18	88.3	1	-	0	96
May	51.5	2	63.4	123	71.6	35	85.2	7	101.6	1	168
Jun	-	0	67.7	193	77.5	39	88.1	15	99.0	2	249
Jul	49.4	5	67.0	150	82.1	13	93.0	3	99.0	2	173
Aug	44.3	7	67.8	304	84.3	28	80.4	5	-	0	344
Sep	47.6	8	64.3	82	80.8	4	-	0	-	0	94
Oct	49.8	2	60.6	22	63.3	2	-	0	-	0	26
Nov+Dec	53.3	37	62.4	258	72.6	4	-	0	-	0	299
Total	51.0	61	64.5	1,316	76.3	150	85.8	34	97.9	6	1,567

APPENDICES

APPENDIX A

METHODS AND EQUATIONS USED IN ANALYSIS OF CATCH AND EFFORT STATISTICS FOR THE STRAIT OF GEORGIA SPORT FISHERY CREEL SURVEYS, 1983-1989[1]

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[1] Adapted from:

Shardlow, T. F., K. K. English, T. Hoyt, G. E. Gillespie and T. A. Calvin. 1989. Strait of Georgia Creel Survey sport fishery statistics, 1983. Can. MS Rep. Fish. Aquat. Sci. 1872 : 53 p.

APPENDIX A. Methods and equations used in analysis of catch and effort statistics for the Strait of Georgia sport fishery creel surveys, 1983-1989.

The description of terms, variables and subscripts used in the data analysis is given in Table A-1.

Calculation of Catch and Effort Statistics

To estimate the monthly catch and effort, three components had to be calculated from that month's data:

(1) the weighted mean daily fishing pattern from interview data,
(2) the weighted mean catch per unit effort from interview data and
(3) the mean sport count from overflight data.

The equations used to estimate the means and variances for all catch and effort statistics are shown below.

Weighting factors used to estimate the daily fishing activity pattern and mean catch per unit effort were calculated using the equations derived from DPA Consulting Ltd. (1982).

The data obtained from each shift were multiplied by the following weighting factor (W1) to expand for all possible stints at each site. The formula reads:

$$W1_{dij} = \frac{N_d}{n_{dij}} \qquad (1)$$

where N_d is the total number of days of type d in that month and n_{dij} is the number of times the jth work block at the ith site was sampled on type d days.

The interviews aggregated by work block were multiplied by the weighting factor W2 to expand for all boats that landed in each work block. The formula reads:

$$W2_{dijk} = \frac{L_{dijk}}{I_{dijk}} \qquad (2)$$

Table A-1. Description of terms, variables and subscripts used in this report.

DESCRIPTION OF TERMS

Shift/Stint	-	Represents a combination of a day type and landing site which was sampled on a single day. i.e. one sampling stint performed by an interviewer.
Work block	-	Represents one of four possible periods at a particular site of a given day type. Work Block 1 is before 11 am Work Block 2 is 11 am - 3 pm Work Block 3 is 3 pm - 7 pm Work Block 4 is after 7 pm
Day type	-	There are two possible day types: weekdays and weekends; holidays are considered to be weekend days.
Time block	-	Each day is divided into 16 time blocks which are: 1) before 7 am 2) 7:00 - 7:59 am 3) 8:00 - 8:59 am . . . 15) 8:00 - 8:59 pm 16) after 9 pm

DESCRIPTION OF VARIABLES

A	-	Number of boats actively fishing
B	-	Number of boats observed on a flight
C	-	Catch
$\bar{C}$	-	Catch of marked salmon
CPE	-	Catch per boat trip
E	-	Effort (estimated total number of boat trips)
I	-	Number of boats interviewed and found to have been fishing
L	-	Number of boats landing
n	-	Number sampled
N	-	Population size from which n samples were observed
P	-	Proportion
T	-	Number of boat trips
V	-	Number found to be marked
W1	-	Weighting factor to expand for all possible stints at each site
W2	-	Weighting factor to expand for all boats that landed in each work

DESCRIPTION OF SUBSCRIPTS

a	-	age
g	-	a set of landing sites
d	-	day type
i	-	site
j	-	work block
k	-	stint
l	-	landing time block
m	-	month
q	-	the next boat landing at site i and upon interviewing, found to have been fishing (q ranges from 1 to n)
r	-	species
s	-	sub-Statistical Area
t	-	time block
u	-	flight
x	-	region
y	-	annual

where L_{dijk} is the number of boats landed and I_{dijk} is the number of boats interviewed on the kth stint in the jth work block at the ith site on a day type d.

Therefore, the following equations can be used to calculate an unbiased estimate of the total monthly catch ($\hat{C}_{dgr}$), fishing trips ($\hat{T}_{dg}$) and fishing activity in time block $\hat{A}_{dgt}$ for each day type (d) where g is a set of landing sites (i). These formulas read:

$$\hat{C}_{dgr} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q \left(W2_{dijk} C_{dijkqr} \right) \right] \quad (3)$$

$$\hat{T}_{dg} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q \left(W2_{dijk} \right) \right] \quad (4)$$

$$\hat{A}_{dgt} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q \left(W2_{dijk} A_{dijkqt} \right) \right] \quad (5)$$

where C_{dijkqr} is the catch of species r by the qth fishing party, and A_{dijkqt} can equal 0 or 1, thereby indicating whether the qth fishing party was actively fishing in time block t. Thus, the mean monthly catch per unit effort (CPE_{dgr}) measured in terms of numbers of fish kept per completed boat trip, and proportion of daily fishing effort active during the hour of the aerial survey (P_{dgt}) can be calculated with the following equations:

$$CPE_{dgr} = \frac{\hat{C}_{dgr}}{\hat{T}_{dg}} \quad (6)$$

$$P_{dgt} = \frac{\hat{A}_{dgt}}{\hat{T}_{dg}} \quad (7)$$

where CPE_{dgr} and P_{dgt} are calculated for each day type (d) and group of landing sites (g). The groups of landing sites reflect geographic areas with similar catch rates and/or activity patterns.

The estimated mean number of boats fishing during the hour of the sport boat count by overflight was calculated for each sub-Statistical Area using the following equation:

$$\overline{B}_{dst} = \frac{\sum_{u} B_{dstu}}{n_{ds}} \qquad (8)$$

where B_{dstu} is the number of boats observed fishing on flight u at time t, in sub-Statistical Area s for day type d.

The mean sport boat count at the time of the overflight ($\overline{B}_{dst}$) and proportion of daily fishing effort active during the hour of the overflight (P_{dgt}) were used in the following equation to calculate the total fishing effort for sub-Statistical Area s on day type d:

$$E_{ds} = \overline{B}_{dst} \frac{1}{P_{dgt}} N_d \qquad (9)$$

where N_d is the number of type d days in the month. Interview data for the sub-Statistical Areas fished (s) by anglers landing at each of the sites (i) within a landing group (g) were used to select the proportions (P_{dgt}) that are appropriate for each mean boat count ($\overline{B}_{dst}$).

The estimate for total effort by sub-Statistical Area and day type (E_{ds}) and the weighted catch per boat trip for a group of landing sites by day type, area and species (CPE_{dgr}) were used to calculate total catch for each species (r) and each sub-Statistical Area (s):

$$C_{sr} = \sum_{d} (E_{ds} CPE_{dgr}) \qquad (10)$$

The interview data were also used to select the catch per effort estimates (CPE_{dgr}) that should be applied to the effort estimates (E_{ds}) for a specific sub-Statistical Area (s).

Variance of Total Fishing Effort

The variance for estimates of total fishing effort has two components:

(1) the variance in aerial sport boat counts:

$$S^2_{B_{dst}} = \frac{\sum_u B^2_{dstu} - \frac{\left(\sum_u B_{dstu}\right)^2}{n_{ds}}}{n_{ds}(n_{ds}-1)} \left[\frac{N_d - N_{ds}}{N_d - 1}\right] \qquad (11)$$

where B_{dstu} is the aerial sport boat count at time t during an aerial survey u on a type d day in sub-area s; n_{ds} is the number of aerial surveys in which boats were counted on type d days, in sub-Statistical Area s; and N_d is the total number of type d days in the months.

(2) the variance in the proportion of boats fishing during the hours of the aerial boat counts:

$$S^2_{P_{dgt}} = \frac{P_{dgt}(1-P_{dgt})}{I_{dg}} \qquad (12)$$

where P_{dgt} is the mean proportion of boats fishing for a group of landing sites g during the hour of the aerial boat count t on type d days, and I_{dg} is the total number of sport fishing boats interviewed. The above formula assumes P_{dgt} is unbiased and normally distributed where the number of interviews is large.

The variances for boat counts ($S^2_{B_{dst}}$) and proportion of boats fishing ($S^2_{P_{dgt}}$) were combined in the following equation to calculate variance for effort:

$$S^2_{E_{ds}} = N^2_{d} \left(\frac{B^2_{dst}}{P^2_{dgt}} \right) \left(\frac{S^2_{B_{dst}}}{B^2_{dst}} + \frac{S^2_{P_{dgt}}}{P^2_{dgt}} \right) \qquad (13)$$

where $S^2_{E_{ds}}$ is the variance for total effort on type d days in sub-area s, and the formula is the standard formula for the variance of a ratio of two independent random variables.

Variance of Total Catch

The variance for estimates of total catch had two components: (1) the variance for total effort (presented above), and (2) the variance for catch per boat trip.

The variance for catch per boat trip ($S^2_{CPE_{dgr}}$) was calculated using the following equation:

$$S^2_{CPE_{dgr}} = \frac{SS_{CPE_{dgr}} - \frac{(S_{CPE_{dgr}})^2}{I_{dg}}}{I_{dg}(I_{dg}-1)} \qquad (14)$$

where $SS_{CPE_{dgr}}$ is the weighted sum of squares for CPE_{dgr}, and $S_{CPE_{dgr}}$ is the weighted sum for CPE_{dgr}, such that the sum of the weighting factors used to estimate CPE_{dgr} was equal to the number of interviewed boat trips (I_{dg}).

The variance for total effort and the variance in the catch per boat trip for the appropriately grouped landing sites were combined in the following equation to calculate variance for total catch:

$$S^2_{C_{sr}} = \sum_{d} \left(E^2_{ds} S^2_{CPE_{dgr}} + CPE^2_{dgr} S^2_{E_{ds}} + S^2_{CPE_{dgr}} S^2_{E_{ds}} \right) \qquad (15)$$

which is the standard formula for the variance of the product of two independent random variables, and where $S^2_{C_{sr}}$ is the variance for total number of species r in sub-Statistical Area s.

Estimation of Marked Chinook and Coho Salmon

The incidence of marked (adipose-clipped) chinook and coho was recorded in each interview. The proportion of marks observed for each region, month and species (P_{xmr}) was calculated as:

$$P_{xmr} = \frac{V_{xmr}}{n_{xmr}} \qquad (16)$$

where V is the number of marked fish observed and n is the number of fish inspected by region (x), month (m) and species (r).

The variance of each proportion was calculated as:

$$S^2_{P_{xmr}} = \frac{P_{xmr}(1-P_{xmr})}{n_{xmr}} \qquad (17)$$

Monthly catch estimates of marked salmon were calculated as:

$$\hat{C}_{xmr} = P_{xmr} C_{xmr} \qquad (18)$$

where C_{xmr} is the estimated catch of species r in region x and month m.

The variance of the marked catch estimates was calculated as:

$$S^2_{\hat{C}_{xmr}} = P^2_{xmr} S^2_{C_{xmr}} + C^2_{xmr} S^2_{P_{xmr}} + S^2_{C_{xmr}} S^2_{P_{xmr}} \qquad (19)$$

where $S^2_{C_{xmr}}$ is the variance of the catch estimates of species r in region x and month m.

The estimate annual proportions of marked salmon caught in each region (weighted by the corresponding regional annual catch estimates) were calculated as:

$$P_{xry} = \frac{\acute{C}_{xry}}{C_{xry}} \qquad (20)$$

where

$$\acute{C}_{xry} = \sum_m \acute{C}_{xmr} \quad \text{and} \quad C_{xry} = \sum_m C_{xmr} \qquad (21)$$

The variance of the annual proportions was calculated as:

$$S^2_{P_{xry}} = \left(\frac{\acute{C}_{xry}}{C_{xry}}\right)^2 \left[\frac{S^2_{\acute{C}_{xry}}}{(\acute{C}_{xry})^2} + \frac{S^2_{C_{xry}}}{(C_{xry})^2}\right] \qquad (22)$$

where $S^2_{C_{xry}}$ is the variance of the annual estimated catch of species r in region x.

Estimation of Age Composition of Chinook Catch

Scale samples and length measurements were taken in a sub-sampling program during the interview process. Ages used in this report represent total age of the fish (including both freshwater and oceanic life) according to the Gilbert-Rich (1927) recording convention.

The proportion of chinook at each age and month (P_{am}) was calculated as:

$$P_{am} = \frac{a_m}{n_m} \quad (23)$$

where a_m represents the number of fish observed at age a during month m, and n_m is the total number of fish bio-sampled in that month.

The variance of each proportion was calculated as:

$$S^2_{am} = \frac{P_{am}(1-P_{am})}{n_m} \quad (24)$$

The catch at age of chinook in each month was calculated as:

$$C_{am} = P_{am} C_m \quad (25)$$

where C_m is the estimated catch of chinook salmon in a given month m.

The variance of the catch at age estimate was calculated as:

$$S^2_{C_{am}} = P^2_{am} S^2_{C_m} + C^2_m S^2_{P_{am}} + S^2_{C_m} S^2_{P_{am}} \quad (26)$$

where $S^2_{C_m}$ is the variance of the month catch estimate C_m.

The annual catch at age was calculated as:

$$C_{ay} = \sum_m C_{am} \quad (27)$$

with a variance

$$S^2_{C_{ay}} = \sum_m S^2_{C_{am}} \qquad (28)$$

The annual proportion at age (weighted by monthly catch) was calculated as:

$$P_{ay} = \frac{C_{ay}}{C_y} \qquad (29)$$

with a variance

$$S^2_{P_{ay}} = \left(\frac{C_{ay}}{C_y}\right)^2 \left[\frac{S^2_{C_{ay}}}{(C_{ay})^2} + \frac{S^2_{C_y}}{(C_y)^2}\right] \qquad (30)$$

APPENDIX B

CATCH AND EFFORT STATISTICS BY MONTH AND STATISTICAL AREA FOR THE STRAIT OF GEORGIA, 1989.

APPENDIX B-1. STRAIT OF GEORGIA FISHING EFFORT (NO. BOAT TRIPS), 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Estimate	568	629	218	1,477	1,695	1,803	606	5,993	1,390	940	15,319
	S.E.	211	110	113	296	475	404	122	2,021	383	549	2,257
March	Estimate	636	1,139	138	930	1,894	1,006	803	6,305	606	456	13,913
	S.E.	211	190	59	145	431	269	342	1,485	176	153	1,655
April	Estimate	1,883	3,018	107	981	4,328	885	825	3,642	998	539	17,206
	S.E.	698	684	33	190	850	241	186	373	169	192	1,418
May	Estimate	10,153	16,939	1,322	7,733	18,191	3,081	2,070	6,923	2,195	2,887	71,494
	S.E.	1,993	3,246	361	1,406	2,698	683	890	1,963	1,101	738	5,547
June	Estimate	25,528	23,886	1,763	7,211	12,362	3,813	2,411	13,474	1,864	2,855	95,167
	S.E.	2,701	2,243	318	553	1,265	441	664	1,875	288	578	4,348
July	Estimate	33,948	28,759	1,843	10,442	14,254	6,195	2,043	19,979	2,461	3,947	123,871
	S.E.	2,320	2,210	217	836	1,281	817	421	1,907	589	504	4,211
August	Estimate	31,721	35,031	2,412	10,761	9,075	4,931	6,483	19,143	4,584	7,242	131,383
	S.E.	2,308	3,118	615	716	759	536	2,129	1,322	732	634	4,901
September	Estimate	19,530	21,008	1,402	6,376	8,976	4,860	2,291	18,443	3,248	7,713	93,847
	S.E.	1,888	1,990	304	678	1,013	475	513	2,167	541	498	3,851
October	Estimate	3,938	2,074	106	1,314	1,454	1,966	801	5,078	680	1,346	18,757
	S.E.	1,364	421	54	404	210	238	213	974	325	488	1,909
Nov+Dec	Estimate	792	1,139	116	1,679	2,564	4,337	577	8,434	1,392	1,344	22,374
	S.E.	191	310	71	238	742	1,174	195	853	376	276	1,762
Total	Estimate	128,697	133,622	9,427	48,904	74,793	32,877	18,910	107,414	19,418	29,269	603,331
	S.E.	5,293	5,910	880	2,078	3,722	1,889	2,541	5,055	1,710	1,568	11,084

APPENDIX B-2. STRAIT OF GEORGIA COHO CATCH SUMMARY, 1989.

Month		Statistical Area 13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	620	369	0	122	428	0	37	1,496	0	30	3,102
	S.E.	602	146	0	107	168	0	40	641	0	49	916
March	Catch	850	1,788	0	45	930	0	0	4,457	0	0	8,070
	S.E.	632	502	0	49	233	0	0	1,936	0	0	2,111
April	Catch	1,365	8,646	30	1,198	9,211	30	0	4,562	0	30	25,072
	S.E.	723	3,796	15	466	2,034	30	0	685	0	32	4,445
May	Catch	9,491	8,304	163	3,420	41,152	42	175	2,137	30	86	65,000
	S.E.	2,135	1,881	50	793	7,746	58	208	744	22	34	8,326
June	Catch	30,334	42,198	1,764	4,595	8,157	30	148	1,870	30	118	89,244
	S.E.	3,620	4,608	436	755	1,378	22	76	362	16	38	6,094
July	Catch	57,580	41,126	2,783	4,646	2,584	253	48	47,932	204	407	157,563
	S.E.	4,798	3,952	368	532	456	113	38	5,087	66	75	8,073
August	Catch	37,065	25,685	2,012	6,265	2,233	494	205	9,148	1,133	2,119	86,359
	S.E.	3,258	2,555	659	710	291	108	199	851	252	285	4,369
September	Catch	15,849	14,547	1,060	4,285	1,494	195	55	9,765	485	1,654	49,389
	S.E.	1,767	1,857	327	1,116	234	80	43	1,338	130	290	3,143
October	Catch	2,892	1,141	0	0	98	323	0	6,525	27	65	11,071
	S.E.	1,630	401	0	0	25	116	0	1,744	20	38	2,424
Nov+Dec	Catch	285	64	30	30	361	0	48	1,535	0	0	2,353
	S.E.	256	41	21	16	204	0	51	362	0	0	493
Total	Catch	156,331	143,868	7,842	24,606	66,648	1,367	716	89,427	1,909	4,509	497,223
	S.E.	7,644	8,075	933	1,861	8,155	221	310	6,073	293	422	15,224

APPENDIX B-3. STRAIT OF GEORGIA CHINOOK CATCH SUMMARY, 1989.

Month		Statistical Area 13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	515	69	172	1,224	1,017	830	37	6,432	383	166	10,845
	S.E.	307	35	92	358	330	324	40	2,638	201	105	2,731
March	Catch	340	69	104	278	350	25	60	357	91	100	1,774
	S.E.	264	48	49	59	170	27	89	245	56	65	428
April	Catch	324	297	34	115	1,009	67	127	355	111	73	2,512
	S.E.	248	73	13	43	250	46	95	83	66	36	394
May	Catch	3,261	8,231	644	2,866	3,012	579	875	1,424	411	592	21,895
	S.E.	801	2,072	206	637	580	262	354	349	206	149	2,470
June	Catch	8,888	4,825	429	1,470	3,109	1,279	461	4,068	127	258	24,914
	S.E.	874	554	92	200	569	358	203	693	32	65	1,448
July	Catch	9,693	2,082	215	1,347	2,611	971	260	3,687	46	107	21,019
	S.E.	780	297	38	171	592	217	123	440	19	24	1,155
August	Catch	9,499	5,494	308	1,770	1,258	903	948	2,542	114	244	23,080
	S.E.	782	740	106	283	155	208	493	276	39	44	1,281
September	Catch	2,711	2,258	315	672	1,061	777	514	1,727	111	311	10,457
	S.E.	534	420	93	161	256	157	239	301	43	85	862
October	Catch	0	91	25	57	222	50	0	936	31	49	1,461
	S.E.	0	36	18	32	54	27	0	266	28	35	281
Nov+Dec	Catch	528	267	63	517	932	836	48	11,011	357	330	14,889
	S.E.	276	148	40	122	344	464	51	1,406	133	102	1,567
Total	Catch	35,759	23,683	2,309	10,316	14,581	6,317	3,330	32,539	1,782	2,230	132,846
	S.E.	1,792	2,333	292	855	1,192	797	709	3,168	337	254	4,717

APPENDIX B-4. STRAIT OF GEORGIA PINK CATCH SUMMARY, 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
March	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
April	Catch	0	19	0	0	0	0	0	0	0	0	19
	S.E.	0	25	0	0	0	0	0	0	0	0	25
May	Catch	41	17	0	0	207	0	0	19	0	0	284
	S.E.	30	24	0	0	66	0	0	15	0	0	78
June	Catch	237	327	3	12	19	0	0	105	0	0	703
	S.E.	57	89	4	7	16	0	0	50	0	0	118
July	Catch	715	437	30	18	42	0	0	11,220	4	8	12,474
	S.E.	203	94	12	9	18	0	0	1,298	5	6	1,317
August	Catch	1,843	480	23	11	226	767	0	30,076	860	1,514	35,800
	S.E.	257	103	14	5	46	222	0	2,728	187	213	2,766
September	Catch	23,179	742	54	13	142	297	55	38,152	2,770	8,175	73,579
	S.E.	2,637	172	29	11	45	144	60	6,703	556	886	7,283
October	Catch	0	19	0	0	0	11	0	96	17	44	187
	S.E.	0	15	0	0	0	9	0	45	17	29	59
Nov+Dec	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	26,015	2,041	110	54	636	1,075	55	79,668	3,651	9,741	123,046
	S.E.	2,658	242	35	17	95	265	60	7,353	587	912	7,902

APPENDIX B-5. STRAIT OF GEORGIA SOCKEYE CATCH SUMMARY, 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
March	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
April	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
June	Catch	0	18	0	1	0	0	0	277	0	0	296
	S.E.	0	13	0	1	0	0	0	125	0	0	126
July	Catch	112	0	0	0	0	0	0	4,269	59	127	4,567
	S.E.	76	0	0	0	0	0	0	630	36	46	637
August	Catch	198	34	7	0	8	335	0	4,240	745	1,312	6,879
	S.E.	69	18	4	0	5	75	0	534	190	217	616
September	Catch	183	0	0	0	0	0	0	345	259	816	1,603
	S.E.	86	0	0	0	0	0	0	104	79	193	248
October	Catch	0	11	0	0	0	0	0	0	0	0	11
	S.E.	0	12	0	0	0	0	0	0	0	0	12
Nov+Dec	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	493	63	7	1	8	335	0	9,131	1,063	2,255	13,356
	S.E.	134	25	4	1	5	75	0	842	209	294	929

APPENDIX B-6. STRAIT OF GEORGIA CHUM CAT .H SUMMARY, 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
March	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
April	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Catch	0	0	0	0	0	0	0	0	17	11	28
	S.E.	0	0	0	0	0	0	0	0	21	14	25
June	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
July	Catch	112	0	0	0	0	0	0	0	0	0	112
	S.E.	50	0	0	0	0	0	0	0	0	0	50
August	Catch	27	0	0	0	0	2	0	20	10	14	73
	S.E.	28	0	0	0	0	2	0	22	7	8	37
September	Catch	2,524	267	0	0	32	0	0	105	46	142	3,116
	S.E.	381	101	0	0	19	0	0	46	21	50	401
October	Catch	3,017	1	0	0	11	31	0	90	16	44	3,210
	S.E.	1,869	1	0	0	5	28	0	45	14	26	1,870
Nov+Dec	Catch	0	93	0	0	0	1,146	0	41	0	0	1,280
	S.E.	0	68	0	0	0	851	0	27	0	0	854
Total	Catch	5,680	361	0	0	43	1,179	0	256	89	211	7,819
	S.E.	1,908	122	0	0	20	851	0	73	34	59	2,096

APPENDIX B-7. STRAIT OF GEORGIA CATCH SUMMARY FOR TOTAL SALMONIDS, 1989. *

Month		Statistical Area 13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	1,135	437	172	1,347	1,445	830	74	7,955	383	168	13,946
	S.E.	689	158	92	359	455	324	81	3,137	201	106	3,294
March	Catch	1,190	1,859	104	323	1,278	20	60	4,814	91	100	9,839
	S.E.	820	503	49	78	325	18	89	2,038	56	65	2,282
April	Catch	1,690	8,962	37	1,313	10,220	73	175	4,934	111	87	27,602
	S.E.	936	3,855	13	468	2,253	46	100	716	66	42	4,644
May	Catch	12,790	16,552	807	6,293	44,373	634	1,050	3,579	448	725	87,251
	S.E.	2,832	3,675	239	1,227	8,069	269	470	969	219	167	9,461
June	Catch	39,460	47,369	2,195	6,078	11,285	1,303	610	6,320	139	375	115,134
	S.E.	4,338	4,942	513	862	1,602	358	241	1,010	34	80	6,930
July	Catch	68,215	43,659	3,044	6,026	5,238	1,223	308	67,671	326	672	196,382
	S.E.	5,325	4,150	396	613	820	249	131	7,006	103	115	9,796
August	Catch	48,631	31,770	2,347	8,046	3,728	2,500	1,154	46,192	2,862	5,205	152,435
	S.E.	3,926	3,074	754	854	420	376	558	3,836	562	601	6,495
September	Catch	44,448	17,875	1,431	4,983	2,732	1,270	624	50,312	3,691	11,194	138,560
	S.E.	4,449	2,138	403	1,161	418	275	271	8,019	710	1,069	9,599
October	Catch	5,909	1,262	14	57	330	416	0	7,648	90	202	15,928
	S.E.	3,025	431	10	32	70	123	0	1,923	55	85	3,615
Nov+Dec	Catch	814	425	76	564	1,293	1,982	96	12,602	357	330	18,539
	S.E.	477	180	48	134	475	1,048	69	1,556	133	102	2,014
Total	Catch	224,282	170,170	10,227	35,030	81,922	10,251	4,151	212,027	8,498	19,058	775,616
	S.E.	10,090	9,194	1,105	2,253	8,621	1,304	843	12,276	974	1,259	20,557

* Includes coho, chinook, pink, chum, sockeye, steelhead and cutthroat trout.

APPENDIX B-8. STRAIT OF GEORGIA CATCH SUMMARY FOR RELEASED SALMON, 1989.*

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	2,457	1,201	450	1,876	3,160	2,576	148	19,722	749	565	32,904
	S.E.	1,099	321	250	577	969	959	110	6,795	472	393	7,080
March	Catch	1,359	783	188	524	2,101	182	210	3,427	336	240	9,350
	S.E.	880	252	93	126	510	131	276	1,546	157	84	1,907
April	Catch	4,882	2,841	86	629	5,458	382	699	4,124	211	109	19,421
	S.E.	1,370	1,156	32	183	1,303	166	279	649	85	53	2,341
May	Catch	4,352	15,875	695	3,552	16,401	804	3,501	1,671	589	632	48,072
	S.E.	986	3,518	223	801	2,853	394	1,144	438	425	282	4,909
June	Catch	10,721	17,143	1,376	3,028	7,835	895	1,369	945	252	388	43,952
	S.E.	1,333	1,799	290	452	1,148	327	548	224	92	133	2,665
July	Catch	53,621	52,343	4,408	12,957	12,830	718	745	21,572	1,987	3,422	164,603
	S.E.	5,001	5,685	677	1,370	1,612	167	272	2,627	551	533	8,358
August	Catch	78,079	138,604	8,093	30,383	31,780	3,109	7,996	65,904	3,190	6,369	373,507
	S.E.	7,128	13,534	2,429	3,126	3,529	458	3,391	5,705	660	778	17,533
September	Catch	97,012	154,129	7,891	40,637	40,199	7,375	4,901	74,340	3,940	10,946	441,370
	S.E.	10,290	17,459	1,930	6,099	5,028	1,124	1,430	9,492	922	1,457	23,943
October	Catch	6,994	11,433	439	1,666	4,320	5,007	1,328	10,526	443	960	43,116
	S.E.	3,269	3,463	311	709	737	1,369	479	2,508	243	383	5,694
Nov+Dec	Catch	1,859	875	265	1,350	1,472	2,454	1,128	13,859	987	762	25,011
	S.E.	704	495	165	272	525	1,563	454	2,082	338	239	2,876
Total	Catch	261,336	395,227	23,891	96,602	125,556	23,502	22,025	216,090	12,684	24,393	1,201,306
	S.E.	14,124	23,445	3,227	7,117	7,315	2,654	3,979	13,762	1,485	1,865	32,889

* Mixed salmon species.

APPENDIX B-9. STRAIT OF GEORGIA ROCKFISH CATCH SUMMARY, 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	36	56	756	849	794	37	952	53	69	3,602
	S.E.	0	20	37	431	272	313	40	482	31	59	773
March	Catch	0	279	9	202	352	98	0	2,506	122	44	3,612
	S.E.	0	190	7	102	117	72	0	1,149	62	34	1,179
April	Catch	922	56	33	421	496	727	64	1,784	315	186	5,004
	S.E.	447	25	10	184	154	203	51	311	103	84	645
May	Catch	2,640	3,467	388	4,968	8,790	1,407	989	4,552	777	1,156	29,134
	S.E.	773	1,210	154	1,001	1,983	486	487	1,157	369	284	3,008
June	Catch	2,923	3,825	746	7,879	8,961	5,065	1,472	3,361	1,201	2,068	37,501
	S.E.	481	800	223	1,248	1,538	1,320	824	613	284	470	2,818
July	Catch	3,667	7,648	536	13,306	5,709	3,707	1,411	1,715	1,224	1,743	40,666
	S.E.	476	1,518	105	1,834	923	776	453	322	340	323	2,809
August	Catch	3,350	9,499	868	13,678	2,700	1,920	239	1,723	1,282	1,894	37,153
	S.E.	473	1,656	265	1,607	477	727	244	245	319	272	2,583
September	Catch	2,853	6,747	426	6,084	4,205	1,610	634	3,003	641	719	26,922
	S.E.	507	1,333	108	995	1,183	339	265	594	166	145	2,241
October	Catch	2,169	118	43	199	664	1,139	67	2,197	295	561	7,452
	S.E.	1,887	45	32	127	136	315	57	727	164	236	2,077
Nov+Dec	Catch	253	162	5	968	923	3,436	79	2,391	26	609	8,852
	S.E.	205	105	6	327	310	1,696	51	471	27	270	1,852
Total	Catch	18,777	31,837	3,110	48,461	33,649	19,903	4,992	24,184	5,936	9,049	199,898
	S.E.	2,311	2,996	411	3,138	3,000	2,519	1,123	2,152	710	801	6,835

APPENDIX B-10. STRAIT OF GEORGIA LINGCOD CATCH SUMMARY, 1989.

Month		Statistical Area											
		13	14	15	16	17	18	19A	19B+	28	29	Total	
Jan+Feb	Catch	0	19	0	0	0	0	0	0	0	0	19	*
	S.E.	0	14	0	0	0	0	0	0	0	0	14	
March	Catch	0	209	0	0	0	0	0	0	0	0	209	*
	S.E.	0	143	0	0	0	0	0	0	0	0	143	
April	Catch	0	1	1	19	11	91	0	123	17	12	275	*
	S.E.	0	1	1	21	9	90	0	47	15	8	105	
May	Catch	2,662	863	71	1,740	1,164	177	70	968	155	260	8,130	
	S.E.	792	451	28	387	326	62	50	308	80	80	1,096	
June	Catch	3,796	1,799	196	1,735	866	638	165	606	48	198	10,047	
	S.E.	579	297	54	283	192	205	144	121	17	50	790	
July	Catch	4,243	2,601	182	1,496	680	252	126	317	44	85	10,026	
	S.E.	601	488	37	243	224	79	70	77	23	27	853	
August	Catch	4,788	1,680	230	1,505	745	148	220	496	42	103	9,958	
	S.E.	579	303	88	229	200	39	204	90	21	27	761	
September	Catch	3,247	1,394	117	899	469	341	0	1,259	2	61	7,789	
	S.E.	586	333	41	238	131	208	0	396	2	26	855	
October	Catch	2,169	63	0	0	203	440	81	1,063	1	4	4,024	
	S.E.	2,507	30	0	0	54	223	117	346	1	5	2,544	
Nov+Dec	Catch	0	0	2	59	625	903	31	189	10	33	1,852	*
	S.E.	0	0	3	37	365	851	38	69	11	31	931	
Total	Catch	20,905	8,629	799	7,454	4,763	2,990	693	5,021	319	756	52,329	
	S.E.	2,879	868	120	632	622	938	291	638	89	110	3,352	

* A total closure for lingcod was in effect from January 1 to April 30, and November 15 to December 31, 1989; see Table 3 footnote.

APPENDIX B-11. STRAIT OF GEORGIA DOGFISH CATCH SUMMARY, 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	2	5	0	0	0	0	0	0	7
	S.E.	0	0	3	4	0	0	0	0	0	0	5
March	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
April	Catch	0	1	0	0	13	0	0	0	0	0	14
	S.E.	0	2	0	0	9	0	0	0	0	0	9
May	Catch	0	21	5	20	55	53	0	17	156	146	473
	S.E.	0	19	3	12	42	53	0	24	154	105	201
June	Catch	79	18	15	56	49	2	0	119	402	611	1,351
	S.E.	31	10	6	27	34	2	0	71	168	310	364
July	Catch	18	133	0	285	30	92	0	73	116	112	859
	S.E.	15	157	0	208	39	69	0	32	57	44	284
August	Catch	63	49	0	0	0	16	0	154	193	107	582
	S.E.	30	24	0	0	0	10	0	46	130	58	155
September	Catch	0	7	0	37	0	116	0	25	27	13	225
	S.E.	0	9	0	26	0	63	0	14	24	7	74
October	Catch	0	0	0	0	0	0	81	0	30	50	161
	S.E.	0	0	0	0	0	0	117	0	33	41	128
Nov+Dec	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	160	229	22	403	147	279	81	388	924	1,039	3,672
	S.E.	46	161	7	212	67	108	117	95	272	338	547

APPENDIX B-12. STRAIT OF GEORGIA CATCH SUMMARY FOR OTHER FINFISH, 1989.

Month		Statistical Area										
		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	30	25	56	198	10,544	111	2,106	69	3	13,142
	S.E.	0	14	17	31	75	6,288	122	1,697	34	1	6,515
March	Catch	0	0	15	48	612	2,976	0	1,911	193	31	5,786
	S.E.	0	0	14	22	332	2,411	0	962	148	29	2,621
April	Catch	0	17	7	24	79	59	0	926	89	78	1,279
	S.E.	0	8	3	11	41	26	0	235	58	44	251
May	Catch	408	579	26	809	811	51	124	881	131	234	4,054
	S.E.	109	219	18	196	256	23	80	233	57	88	486
June	Catch	465	860	61	314	854	448	319	1,166	206	318	5,011
	S.E.	102	279	21	73	250	186	246	197	52	91	549
July	Catch	948	1,174	92	907	870	355	193	510	205	308	5,562
	S.E.	264	282	27	187	231	164	162	140	66	80	567
August	Catch	702	1,852	204	2,060	80	102	239	2,011	462	590	8,302
	S.E.	137	490	101	442	22	47	244	713	147	145	1,038
September	Catch	823	1,724	81	887	631	88	28	1,634	272	263	6,431
	S.E.	233	1,363	34	241	167	31	30	414	85	61	1,478
October	Catch	524	3	43	150	58	902	0	2,145	123	242	4,190
	S.E.	479	2	32	85	18	510	0	668	74	117	982
Nov+Dec	Catch	0	24	10	215	381	1,108	840	726	13	91	3,408
	S.E.	0	25	6	105	191	796	607	185	13	81	1,045
Total	Catch	3,870	6,263	564	5,470	4,574	16,633	1,854	14,016	1,763	2,158	57,165
	S.E.	628	1,518	120	593	603	6,805	733	2,266	267	265	7,453

APPENDIX C

STRAIT OF GEORGIA CREEL SURVEY STUDY AREA

APPENDIX C. Strait of Georgia Creel Survey study area.

The Strait of Georgia Creel Survey study area and landing site locations used in 1989 are shown in Figure C-1. The study area includes those waters of Juan de Fuca Strait and the Strait of Georgia bounded in the south by a line from Sheringham Pt. on Vancouver Island due south to an intersection with the International Boundary and along the International Boundary to the B.C. Mainland coast at Blaine (Boundary Bay) and in the north by the following 3 boundary lines:

1) in Discovery Passage from Granite Pt. on Quadra Island to the stream mouth west of Moriarty Pt. on Vancouver Island.

2) in Okisollo Channel from Granite Pt. on Quadra Island due north to Sonora Island.

3) in Cordero Channel from Burnt Bluff on the mainland 214° passing west of Dent Island to Sonora Island.

The area for which the Strait of Georgia Creel Survey statistics apply includes the above listed administrative area with the exception of the following areas:

1) Bute Inlet above a line from Lawrence Pt. running across the inlet. This area coincides with management units 13-21 and 13-22.

2) Waters of Pryce Channel, Waddington Channel, Pendrell Sound, Homfray Channel and Toba Inlet bounded by a line drawn from Horace Head on East Redonda Island at the south end of Waddington Channel to the northern point of Roscoe Bay on West Redonda Island and a line drawn within Homfray Channel from Price Pt. on the eastern shore of the channel by a line drawn from George Head at the easterly entrance of Ramsay Arm to Sutil Pt. on Cortes Island.

3) Hotham Sound above a line drawn from Elephant Point on the western shore of the Sound to the southern point of Granville Bay on the eastern shore of the Sound.

4) Jervis Inlet above a line drawn within Prince of Whales Reach from the mouth of Treat Creek on the east shore across the Reach to the summit (1625') at the head of Goliath Bay.

5) Sechelt Inlet including Narrows Inlet and Salmon Inlet above a line drawn within Skookumchuck Narrows from the "dog-leg" point southeast of the Egmont Pt. 224° across the Narrows to Sechelt Peninsula.

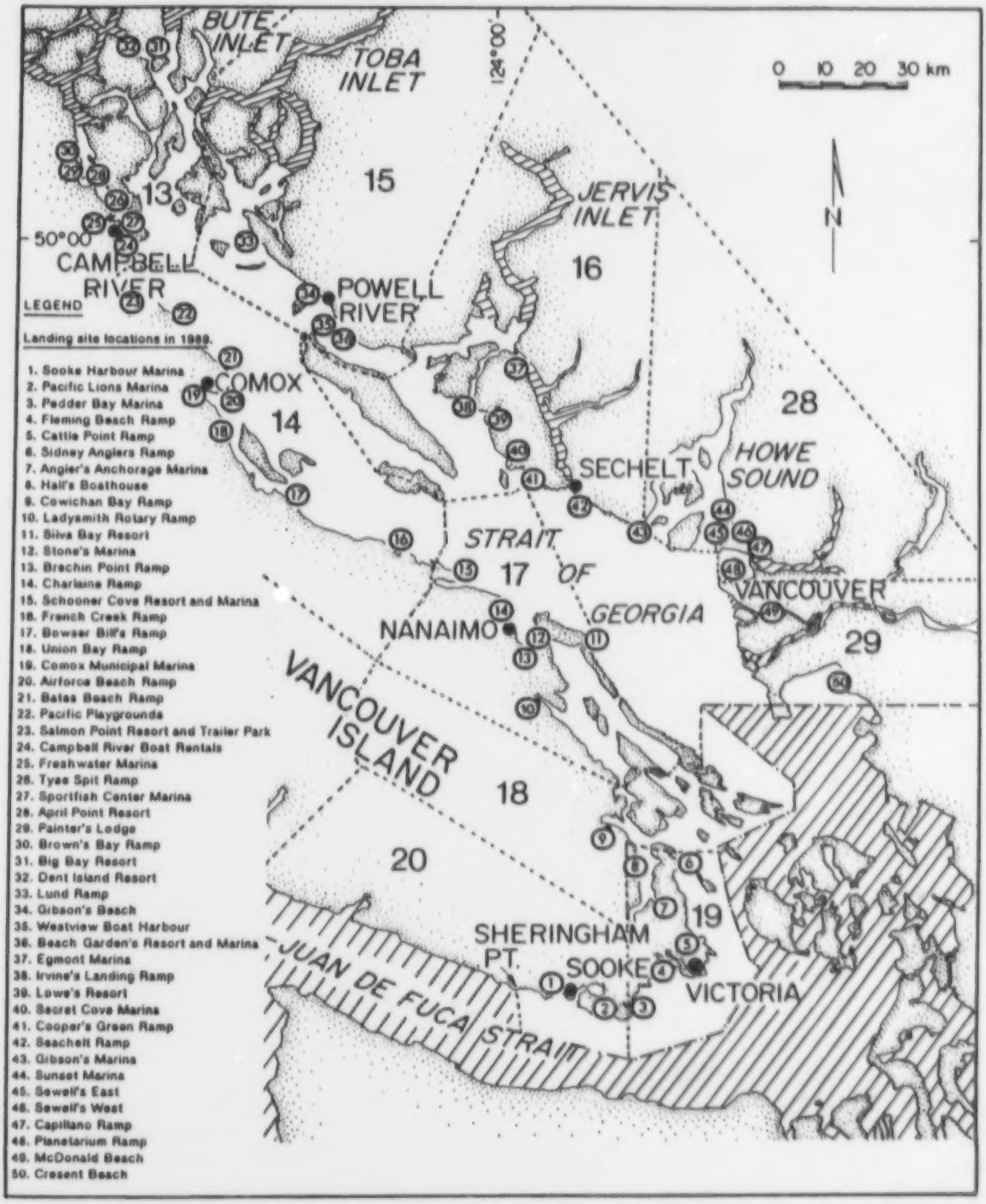

Figure C-1. Strait of Georgia Creel Survey study area and landing site locations used in 1989; hatched areas are not included in the survey area.

APPENDIX D. Species commonly included with other finfish.

Pacific Herring
Pacific Cod
Pacific Tomcod
Walleye Pollock
Pacific Hake
Perches - any perch, seaperch or surfperch
Greenlings
Flounders - Pacific Halibut, any flounder or sole